

Development of a Unified Enantioselective, Convergent Synthetic Approach Toward the Furanobutenolide-Derived Polycyclic Norcembranoid Diterpenes: Asymmetric Formation of the Polycyclic Norditerpenoid Carbocyclic Core by Tandem Annulation Cascade

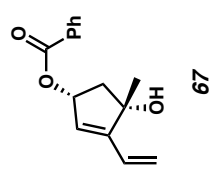
Robert A. Craig, II, Russell C. Smith, Jennifer L. Roizen,
Amanda C. Jones, Scott C. Virgil, and Brian M. Stoltz*

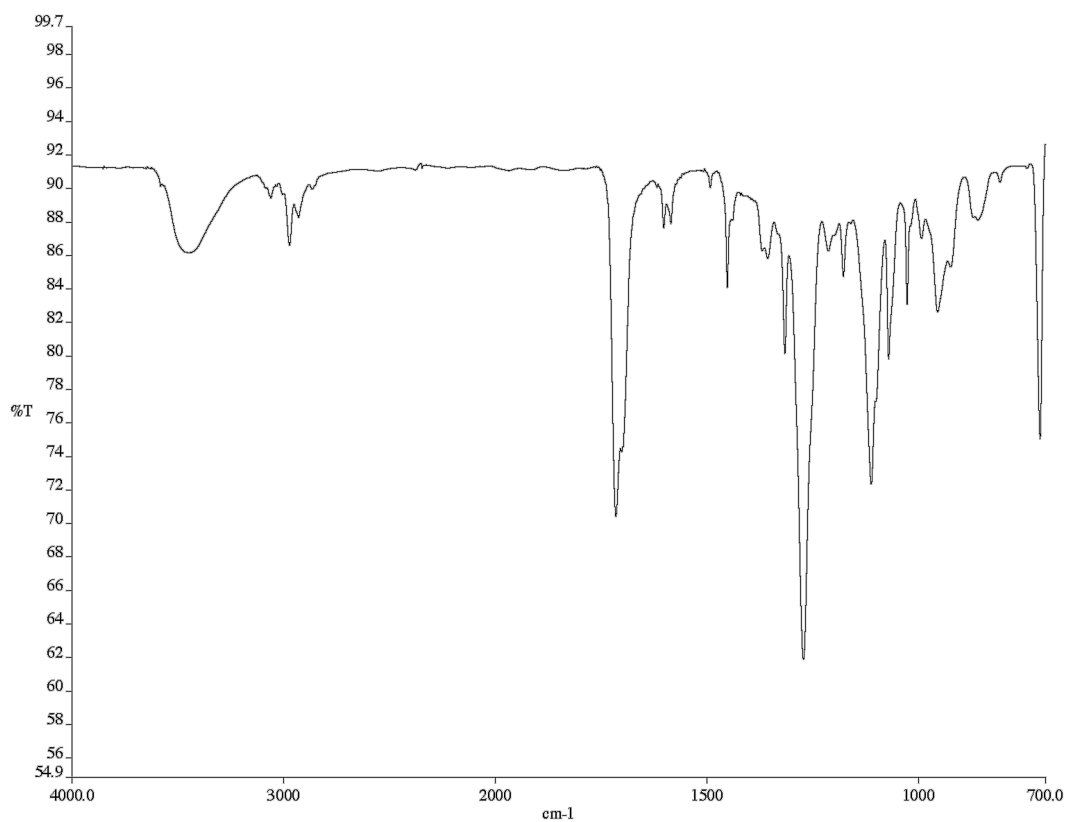
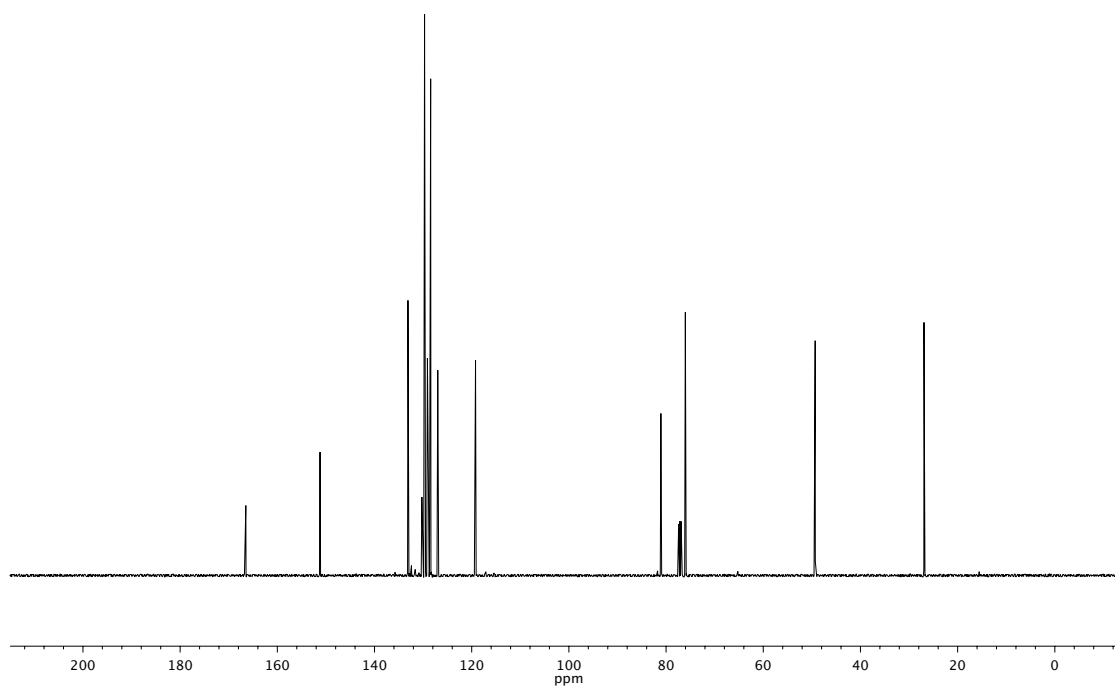
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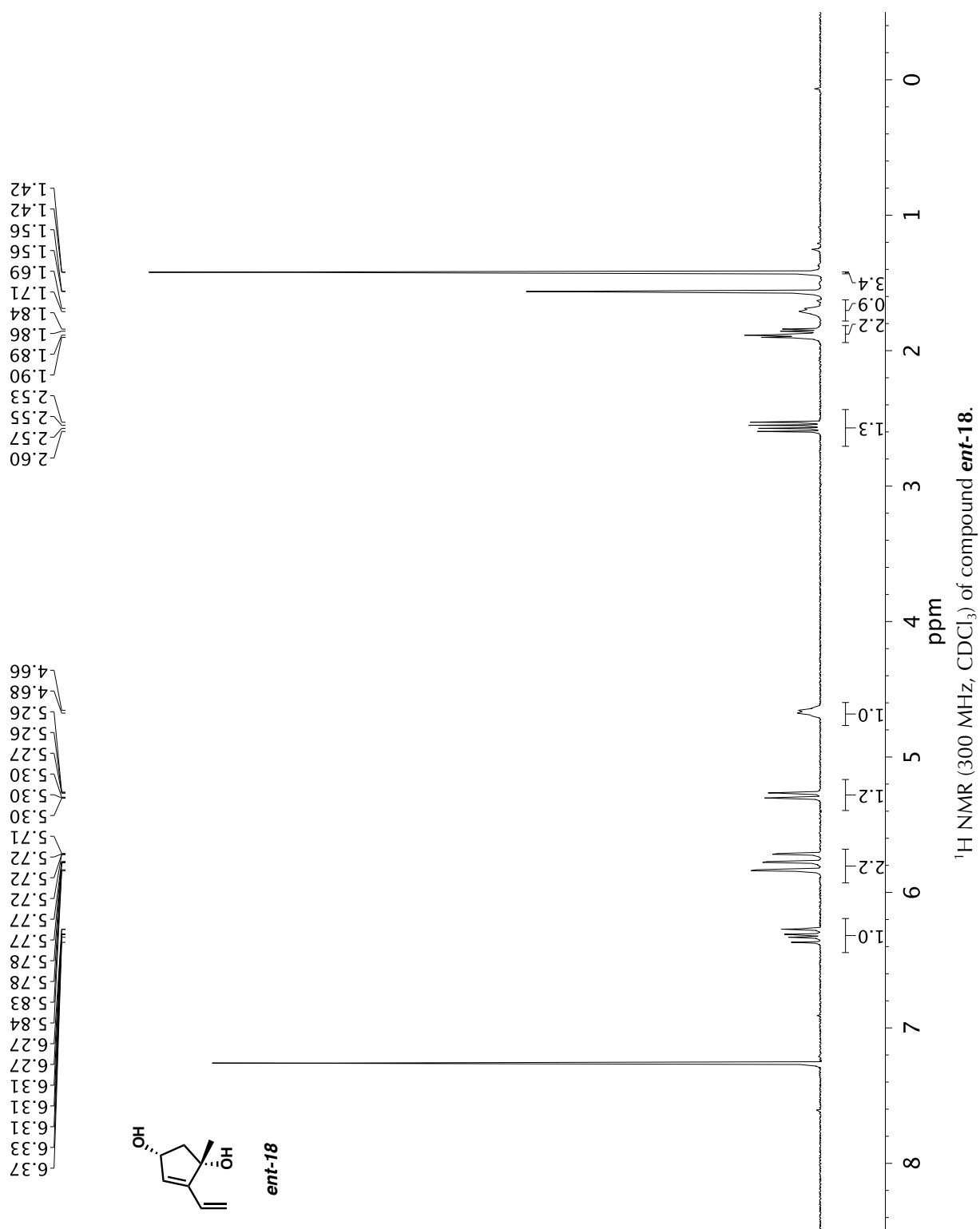
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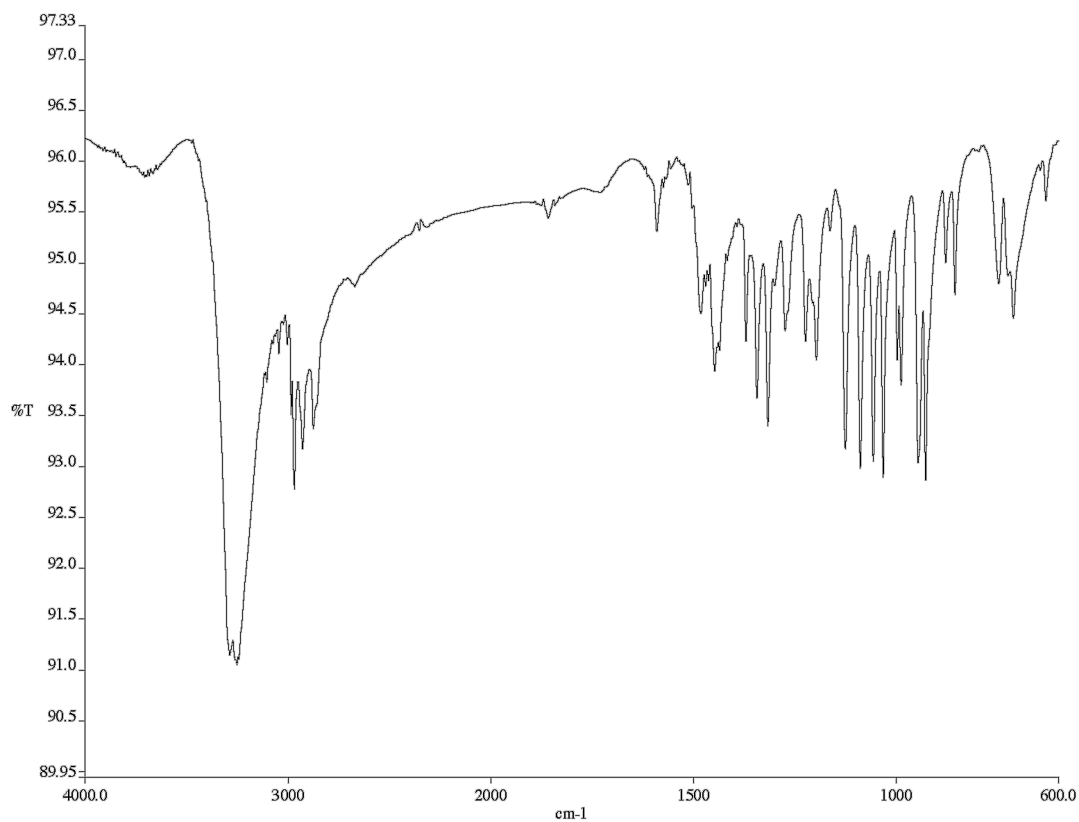
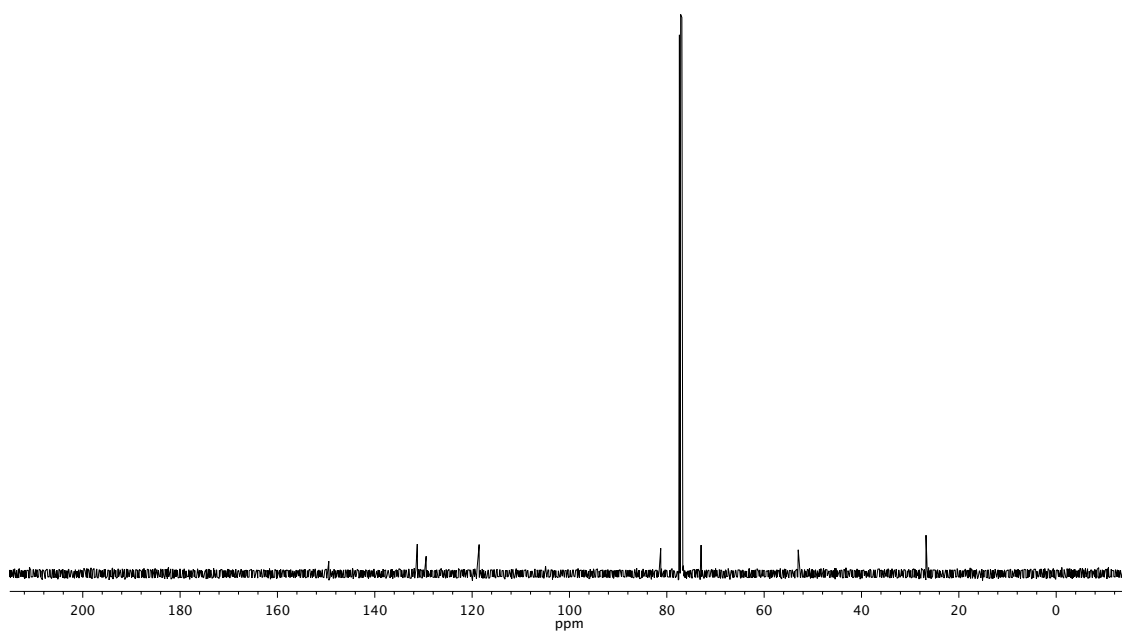
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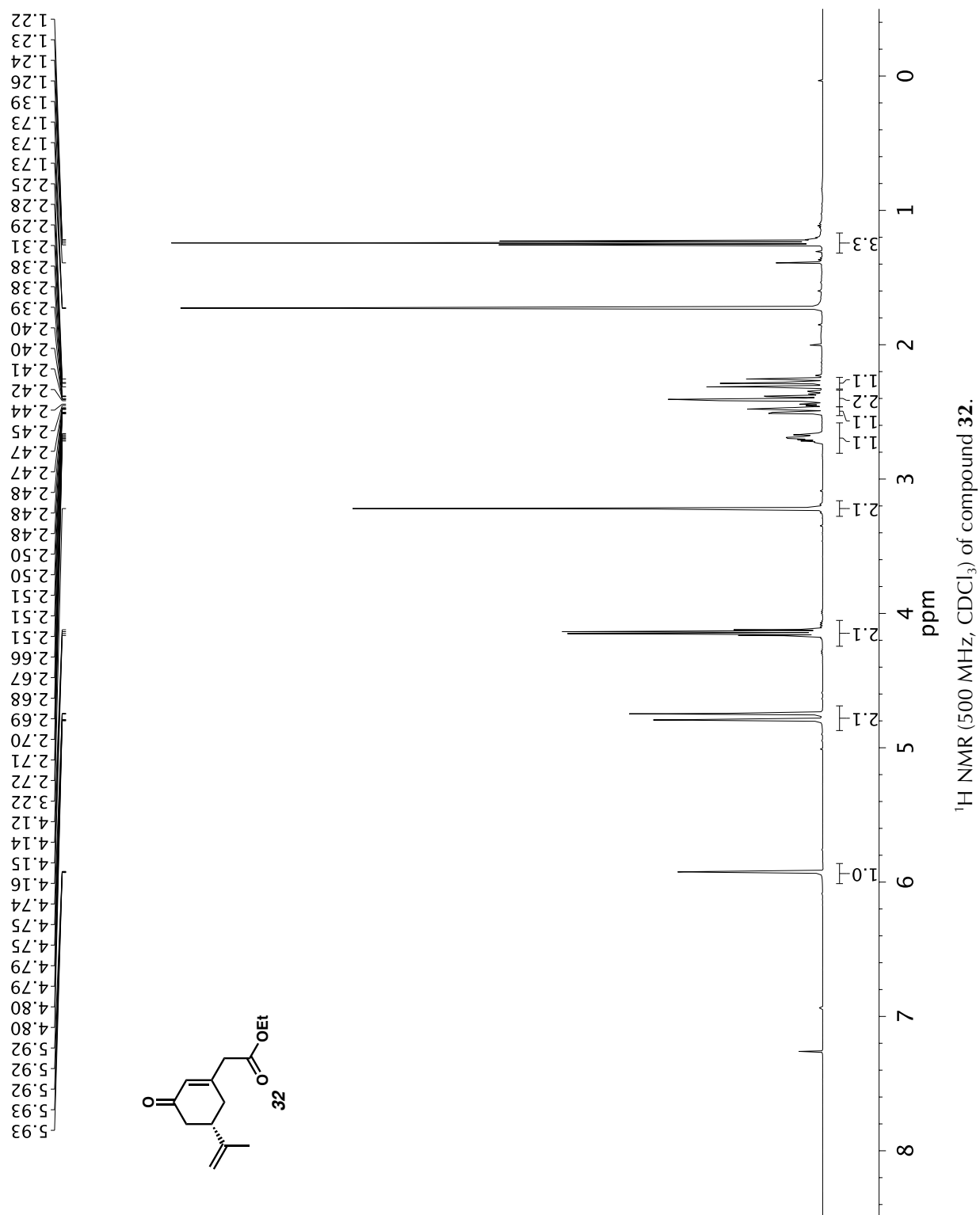
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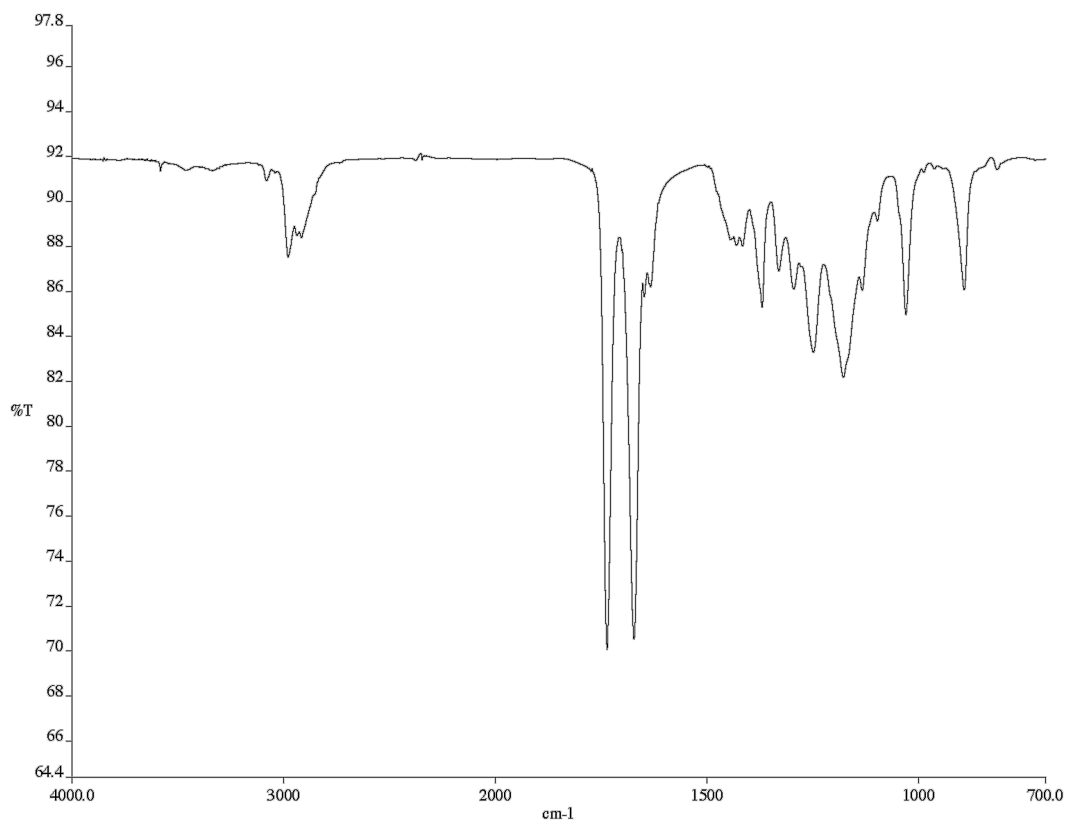
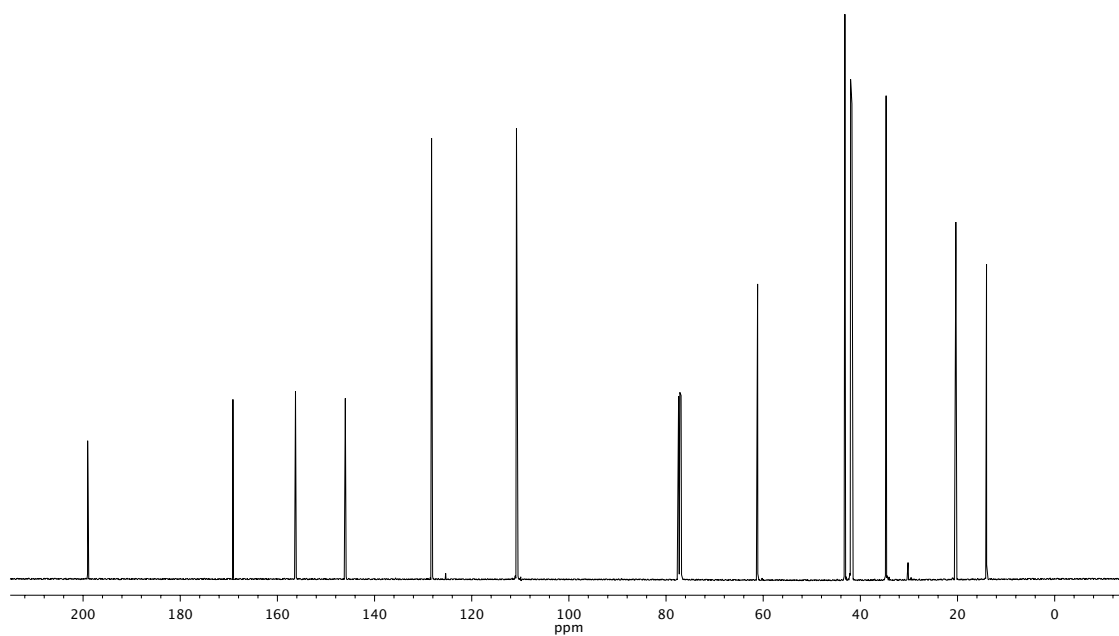


Infrared spectrum (Thin Film, NaCl) of compound **67**.¹³C NMR (126 MHz, CDCl₃) of compound **67**.

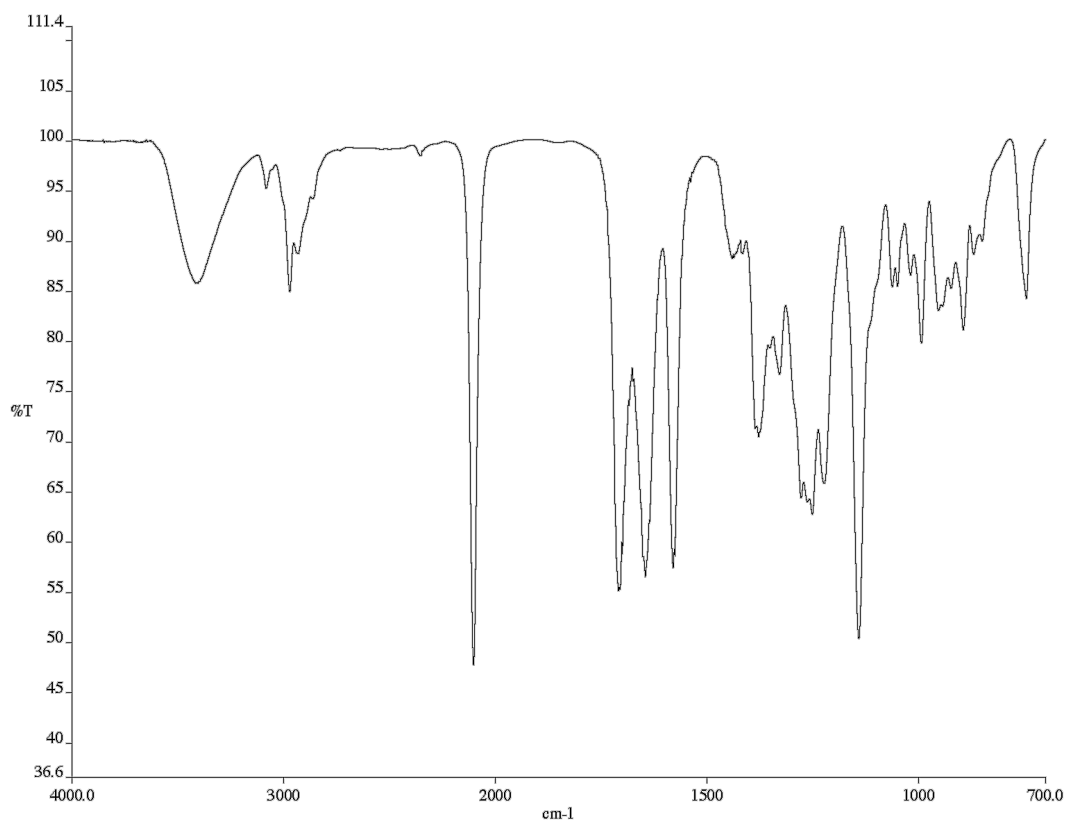
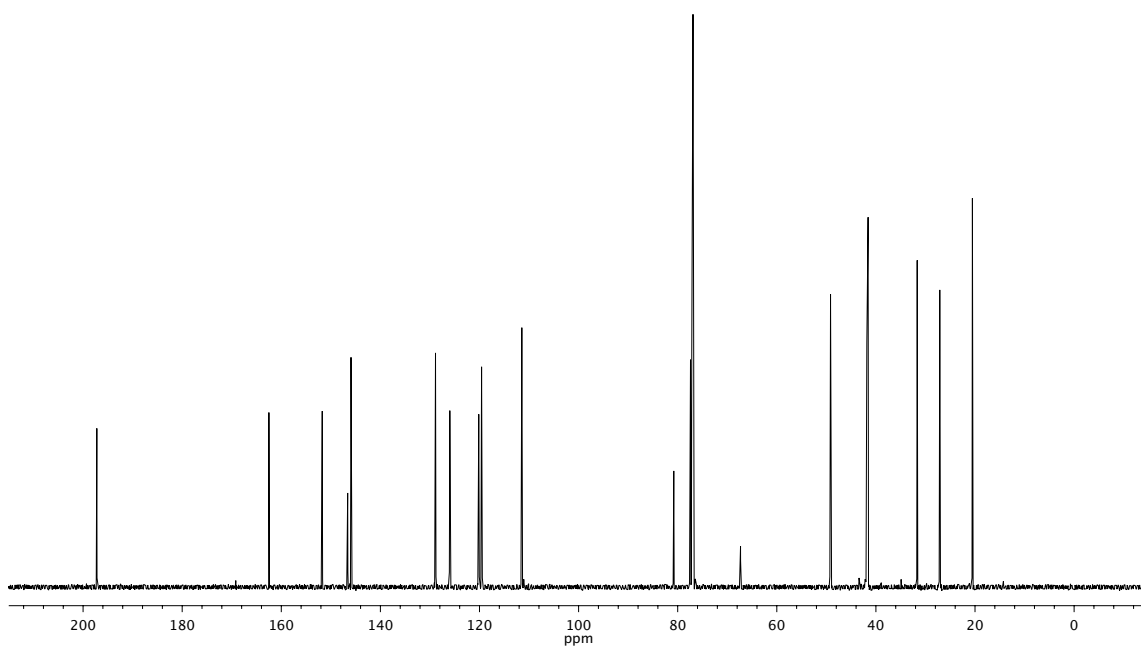


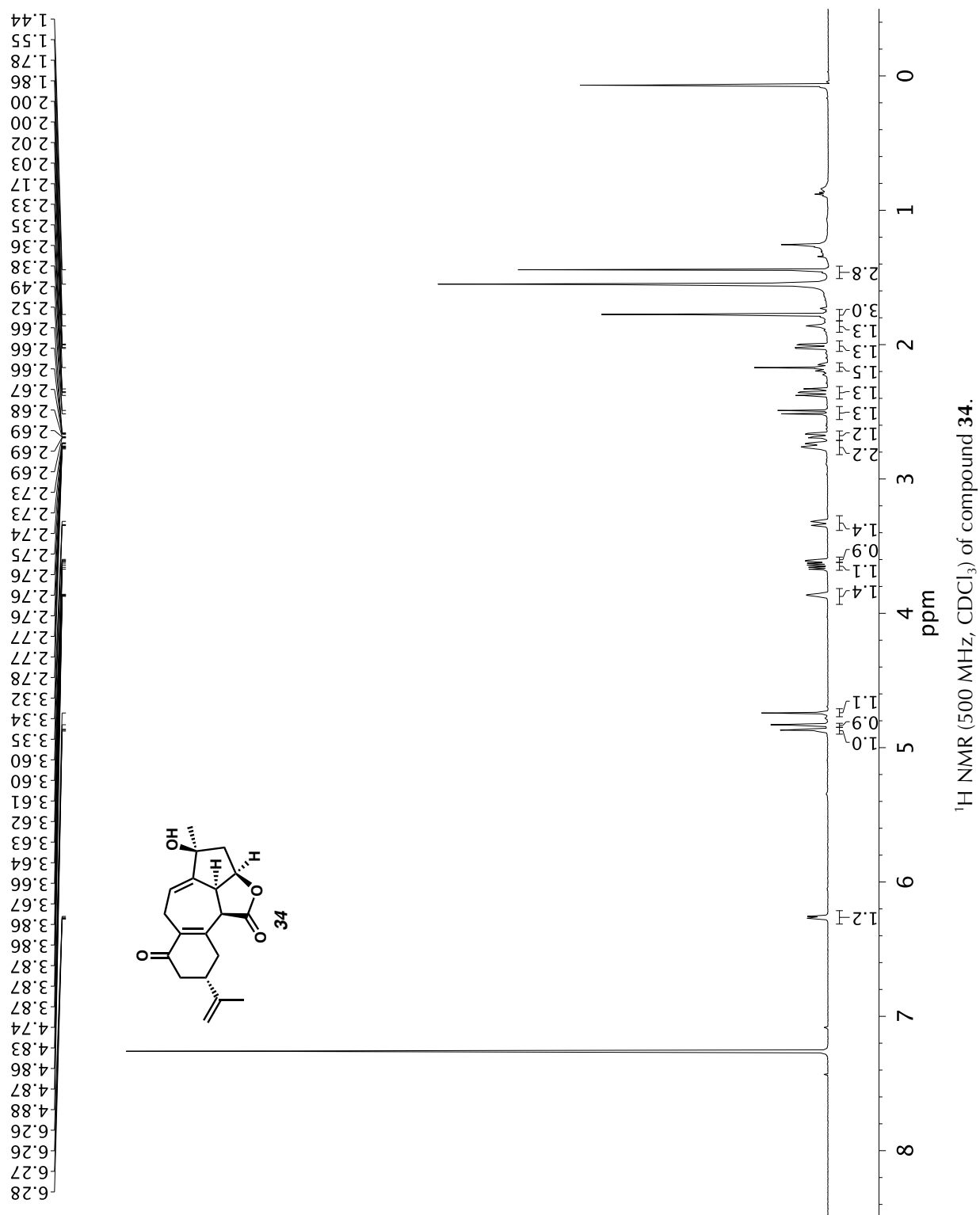
Infrared spectrum (Thin Film, NaCl) of compound **ent-18**.¹³C NMR (76 MHz, CDCl₃) of compound **ent-18**.

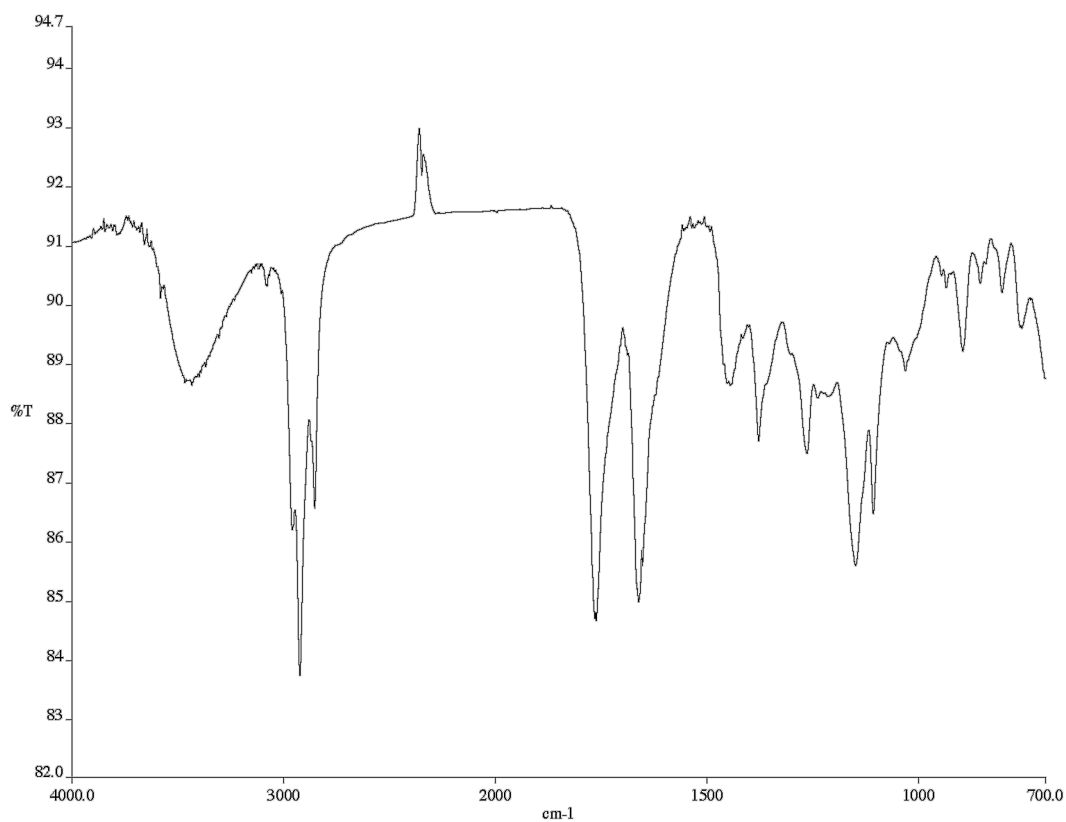


Infrared spectrum (Thin Film, NaCl) of compound **32**.¹³C NMR (126 MHz, CDCl₃) of compound **32**.

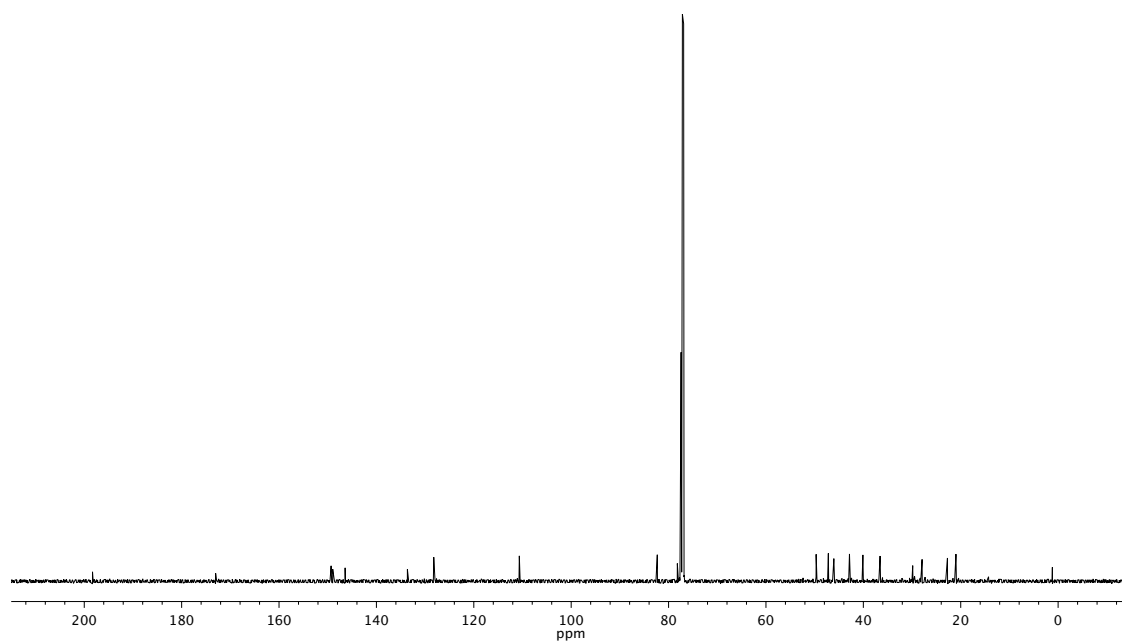


Infrared spectrum (Thin Film, NaCl) of compound **ent-16**.¹³C NMR (126 MHz, CDCl₃) of compound **ent-16**.

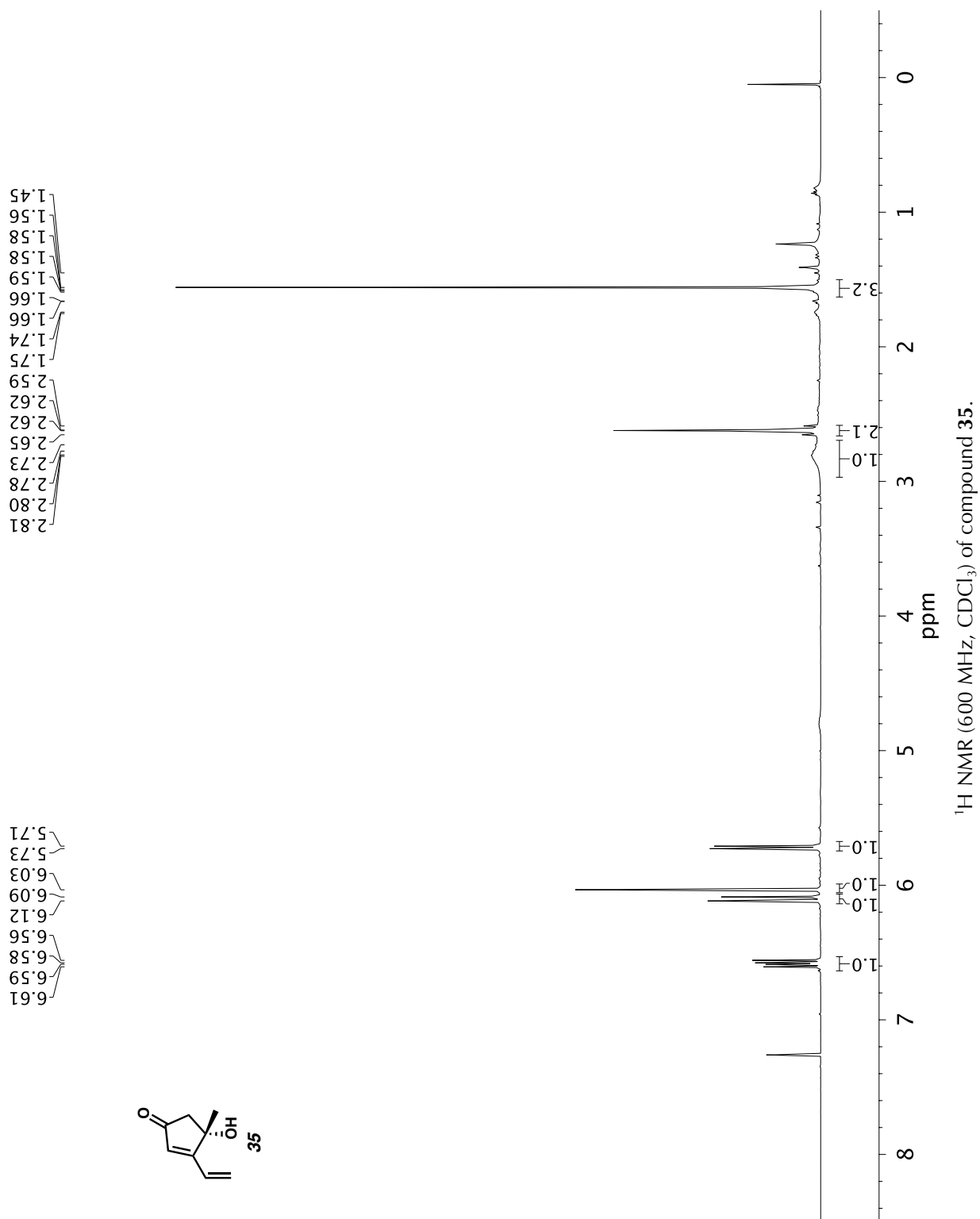


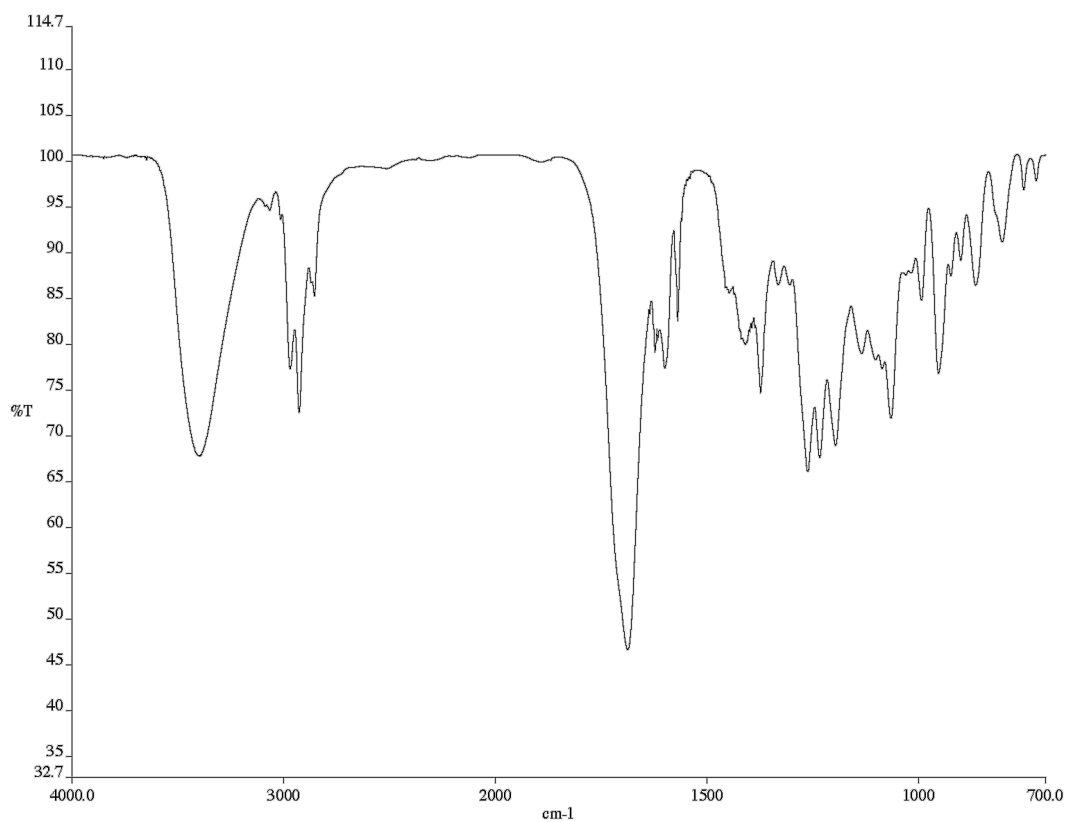
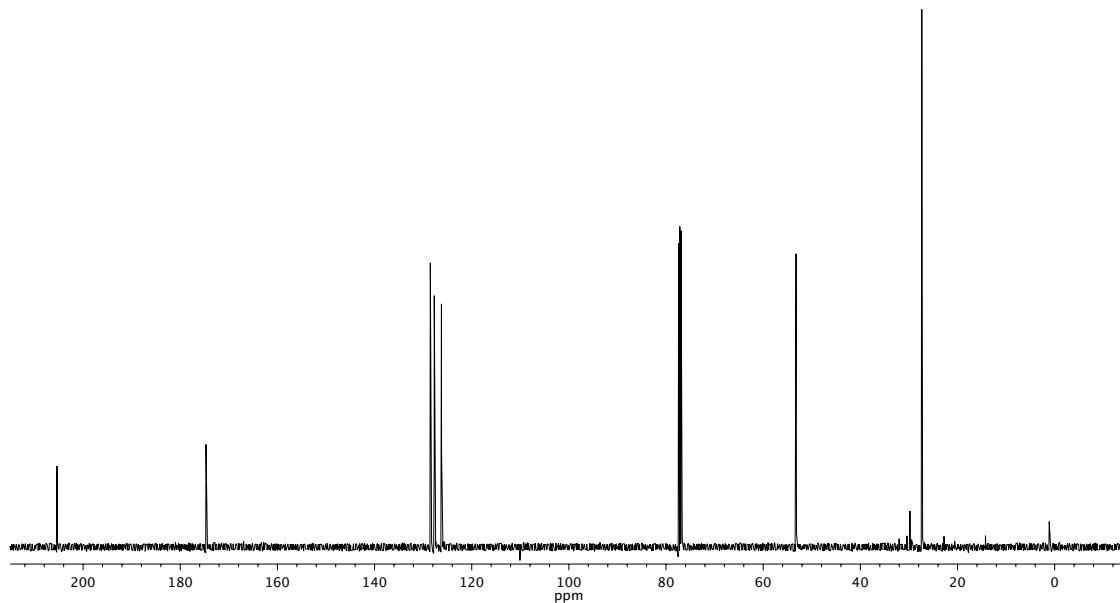


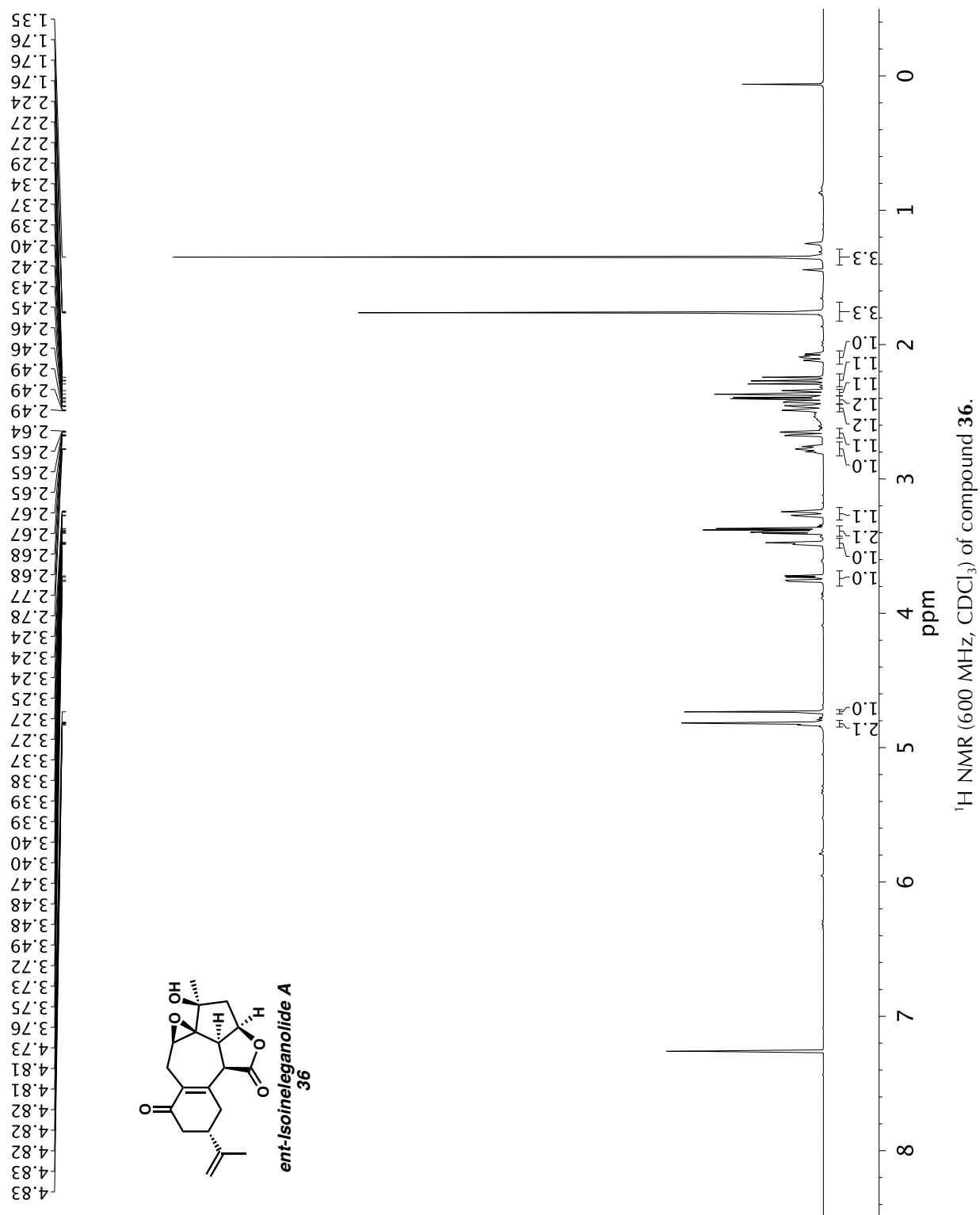
Infrared spectrum (Thin Film, NaCl) of compound **34**.

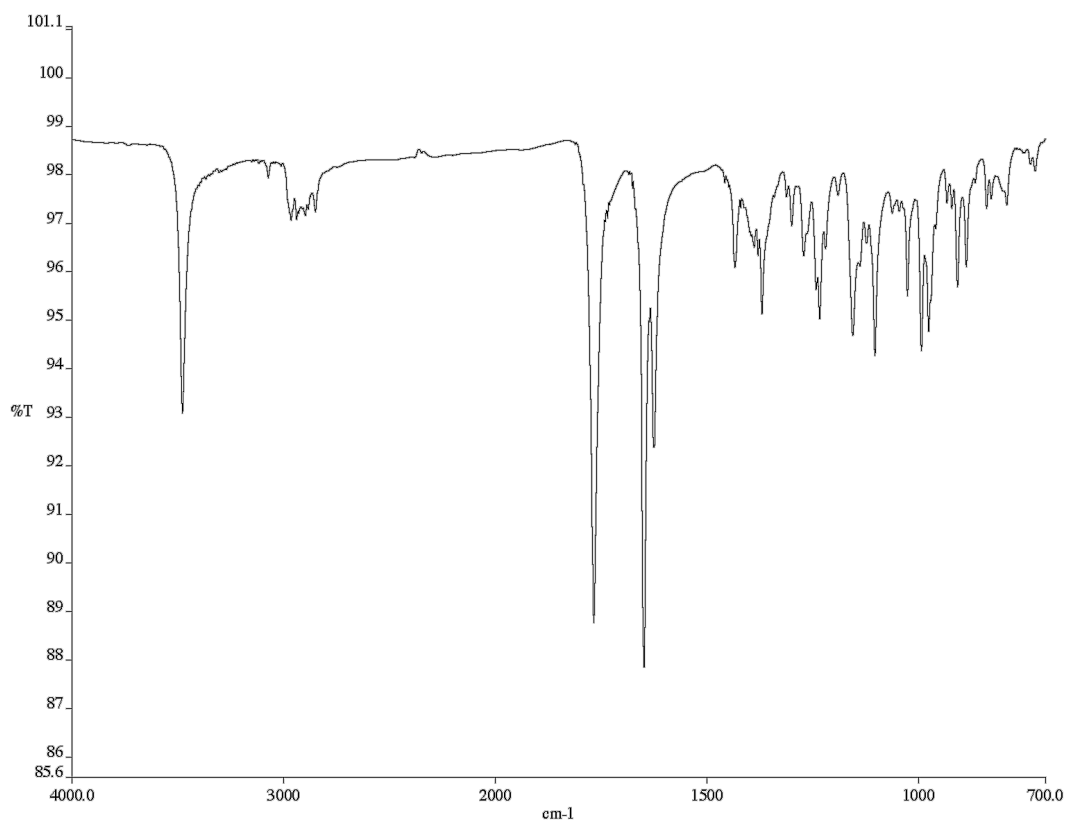
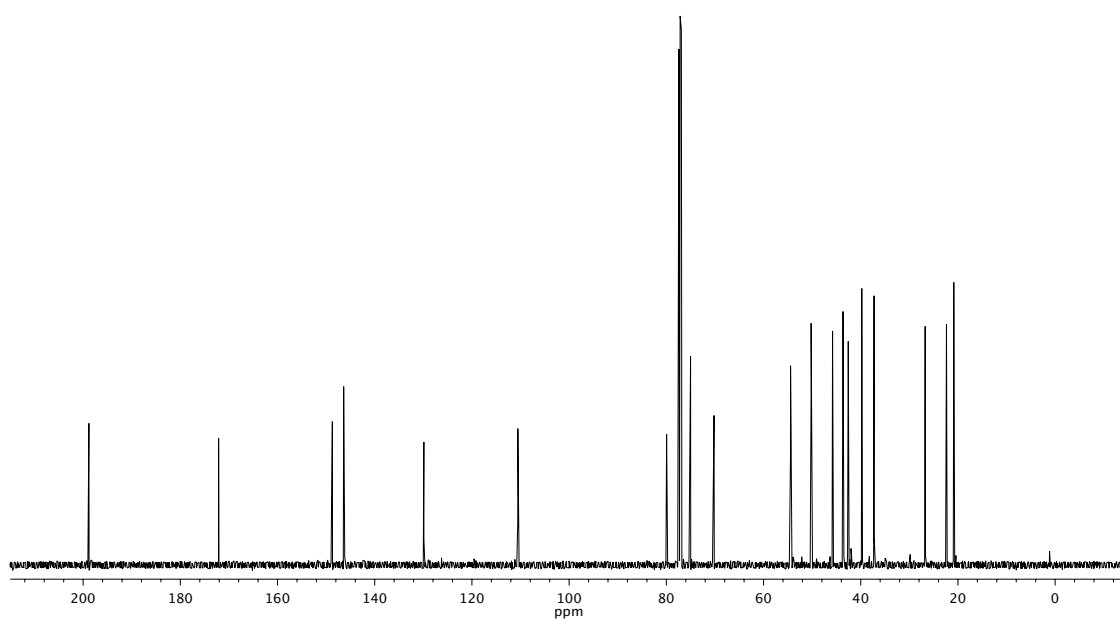


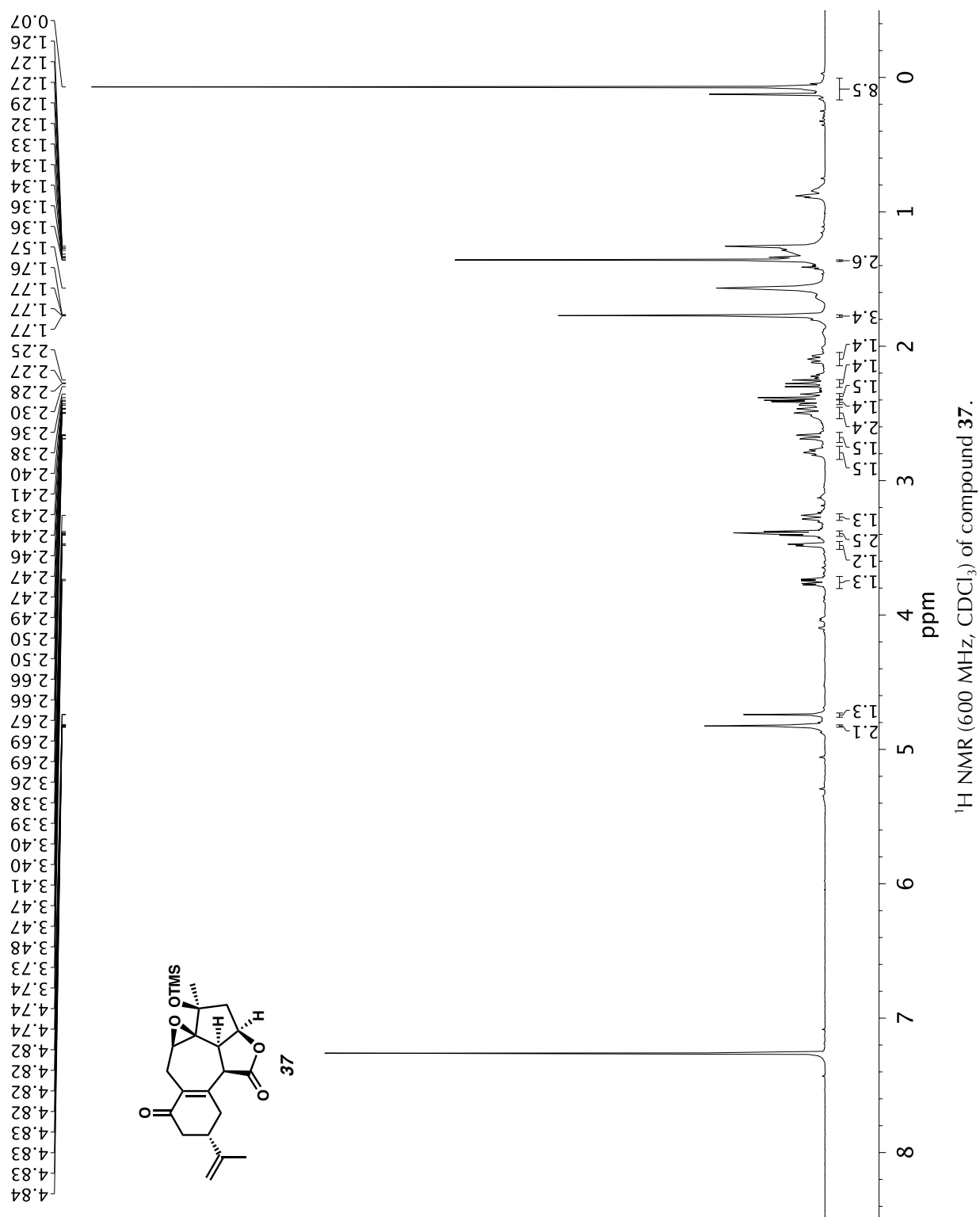
¹³C NMR (126 MHz, CDCl₃) of compound **34**.

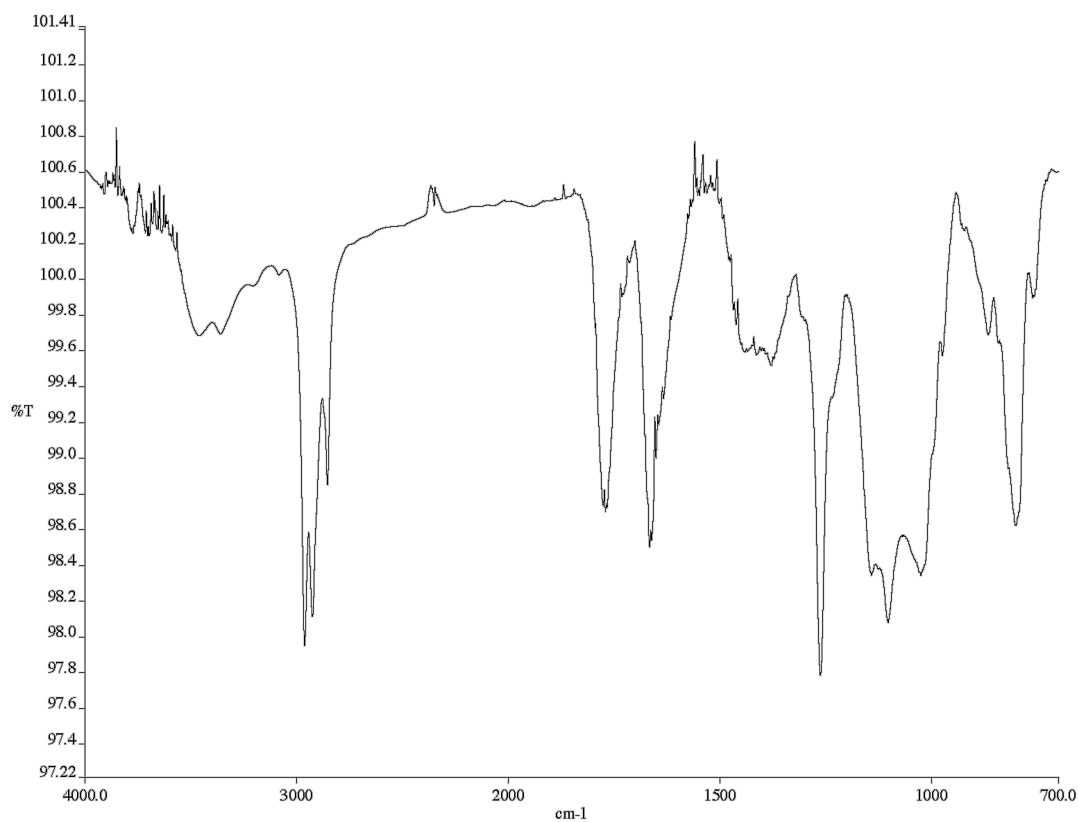
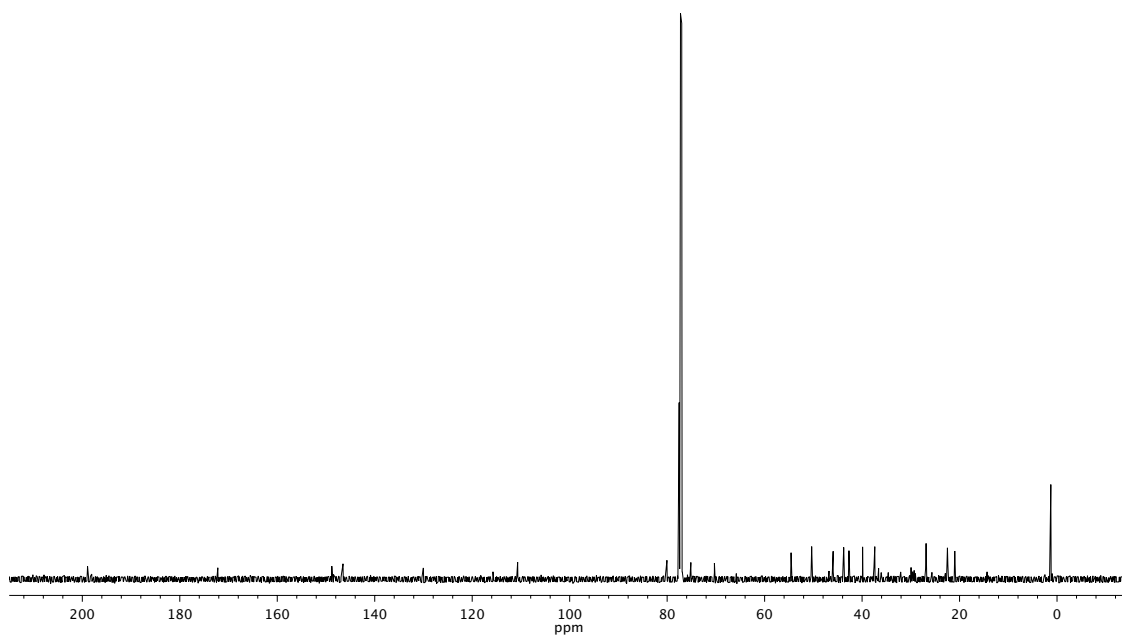


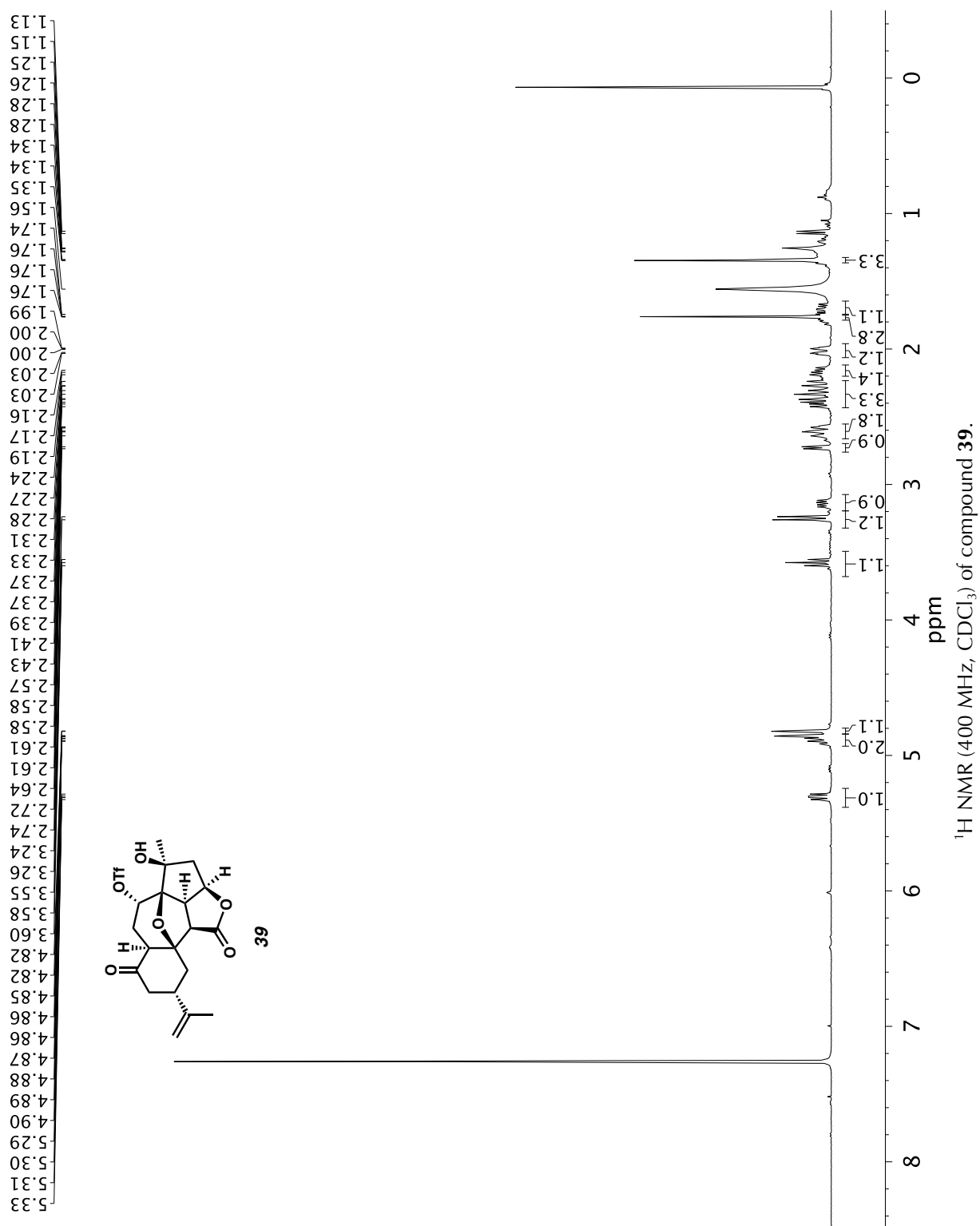
Infrared spectrum (Thin Film, NaCl) of compound **35**.¹³C NMR (126 MHz, CDCl₃) of compound **35**.

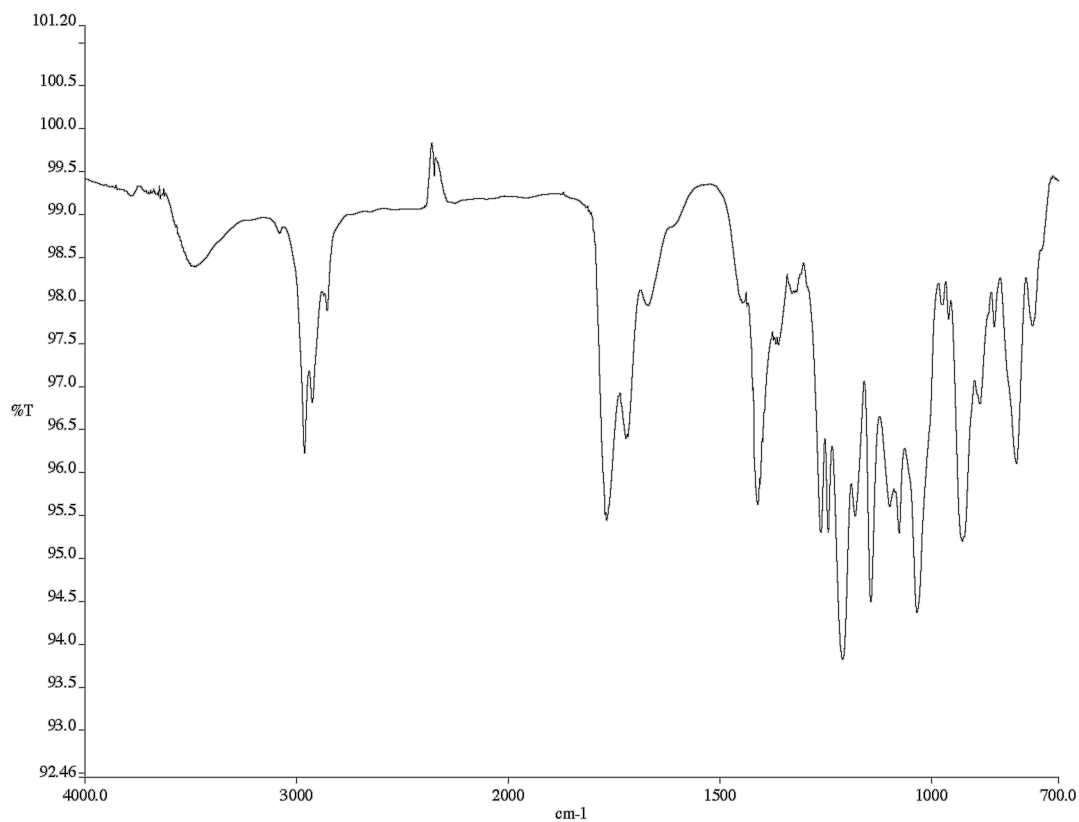
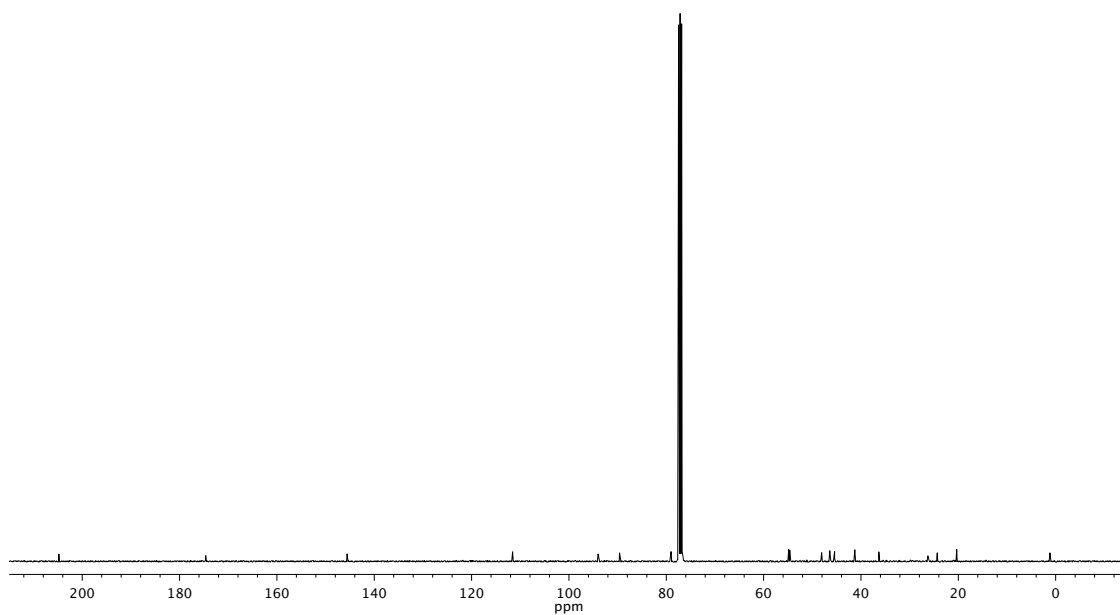


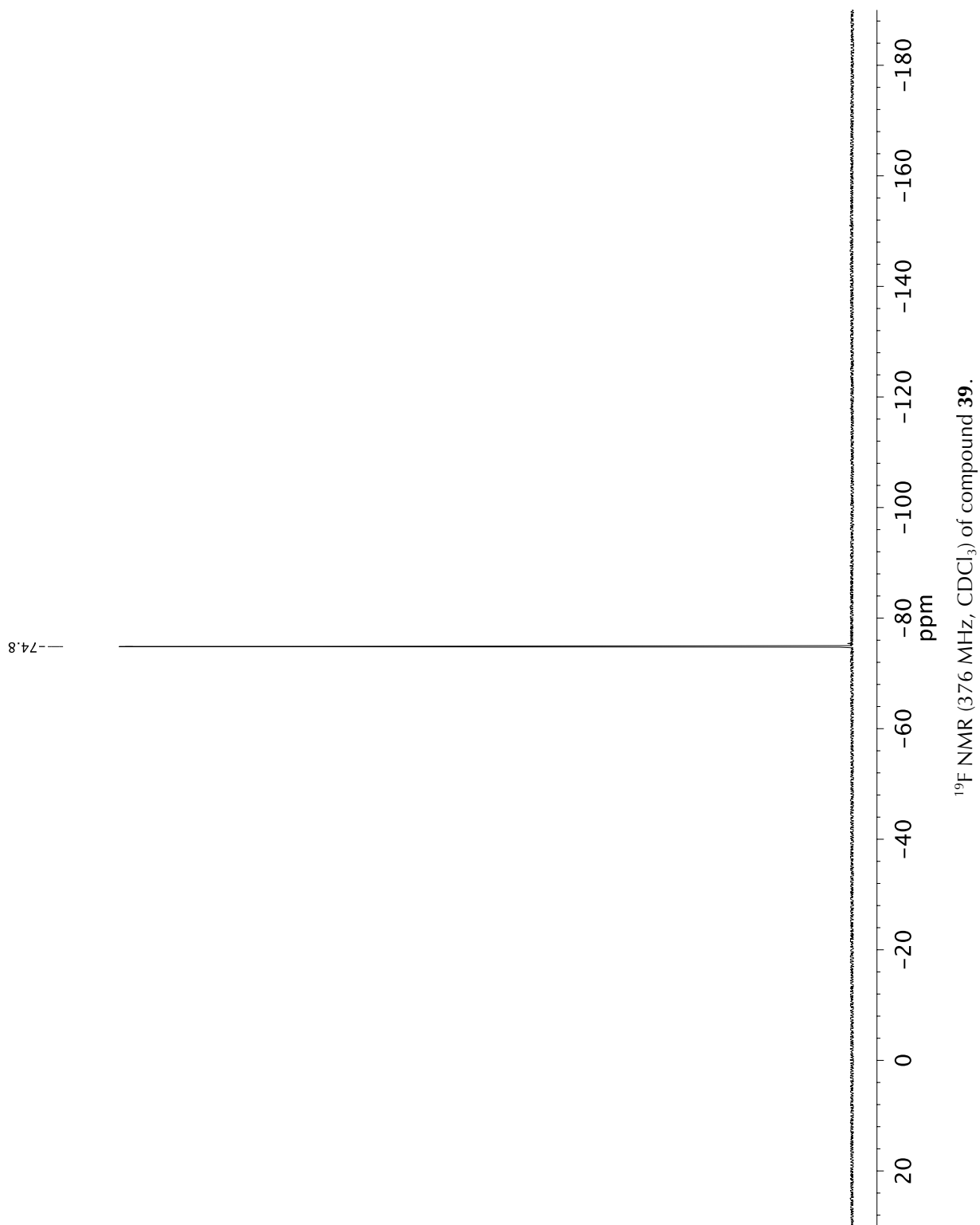
Infrared spectrum (Thin Film, NaCl) of compound **36**.¹³C NMR (126 MHz, CDCl₃) of compound **36**.

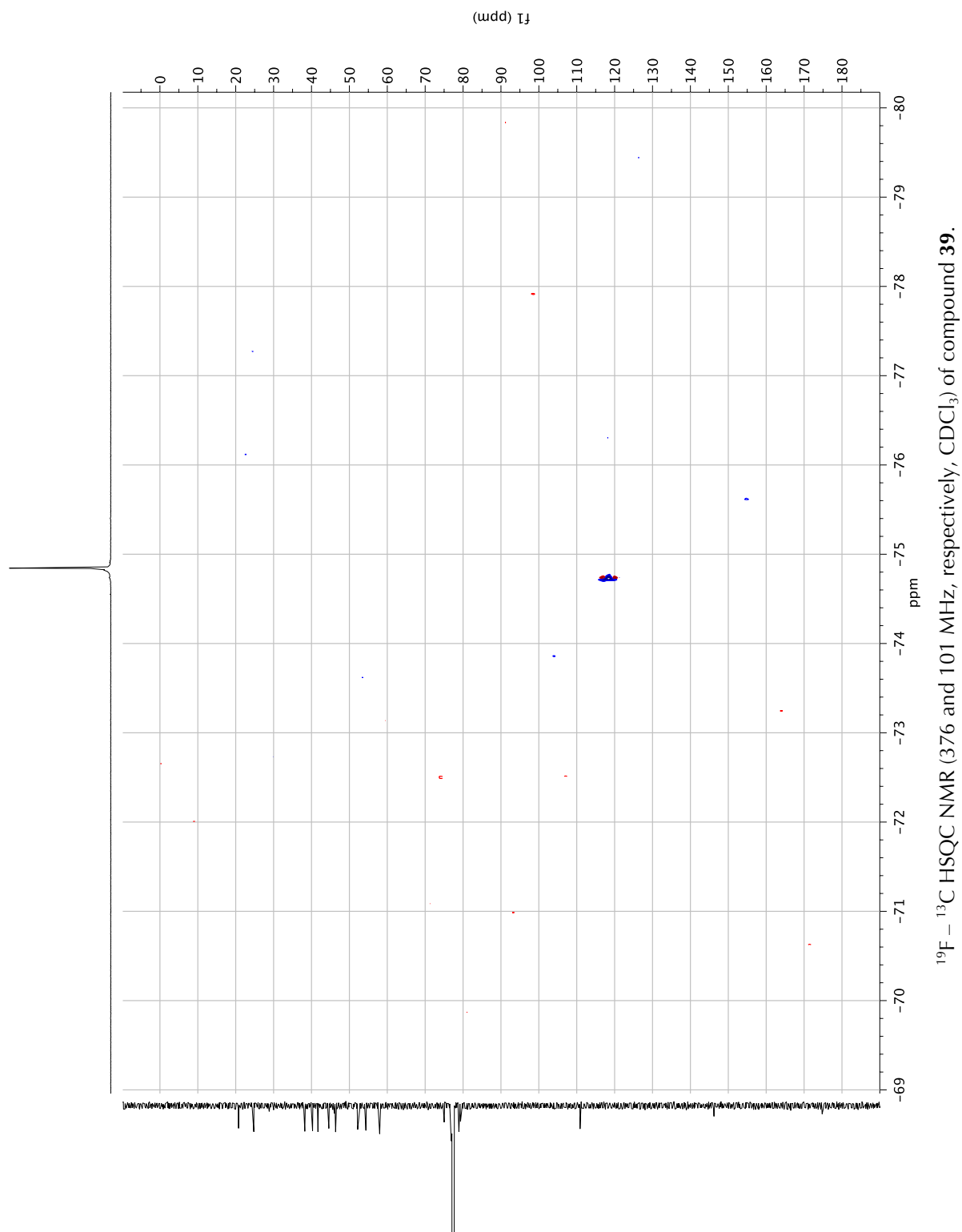


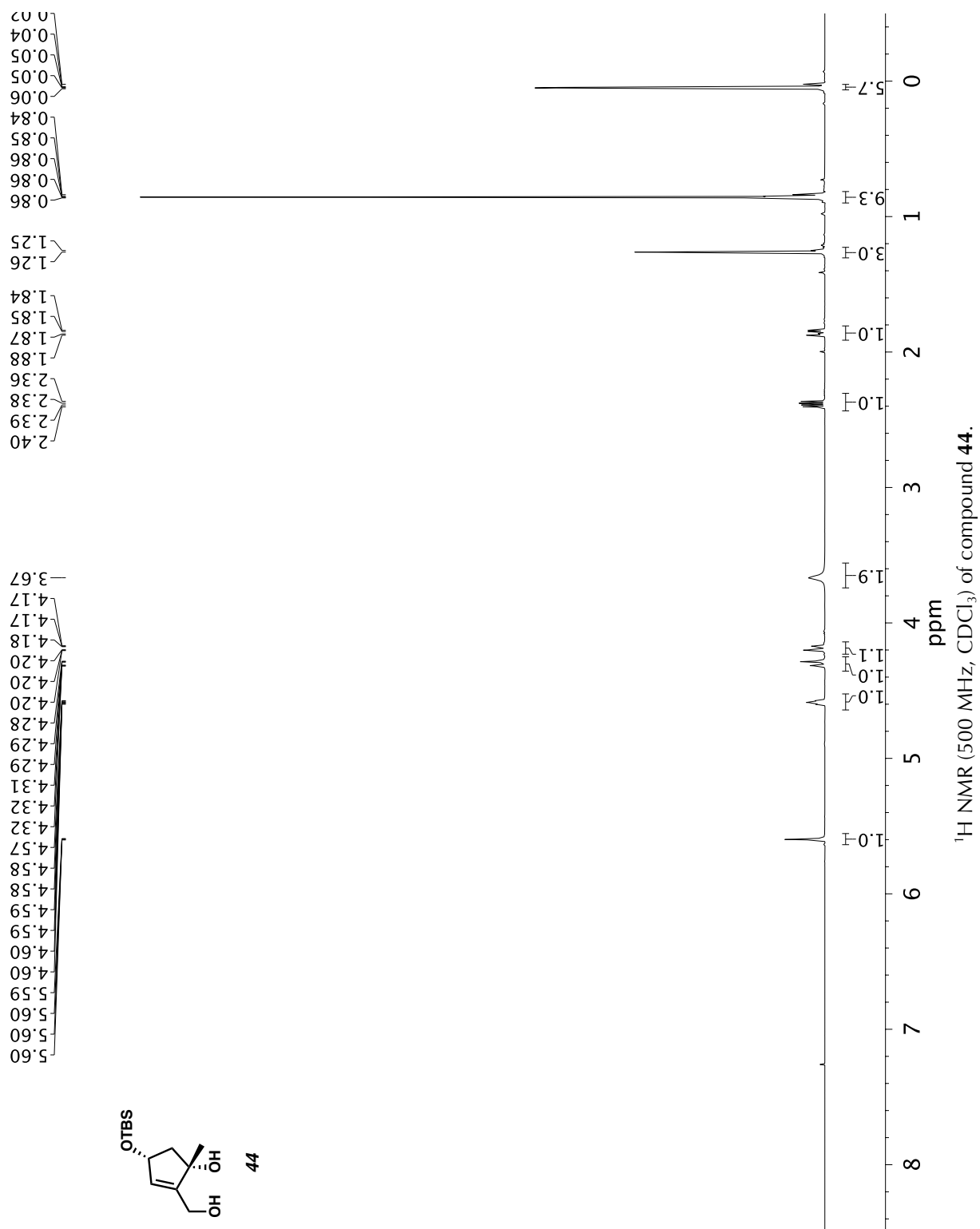
Infrared spectrum (Thin Film, NaCl) of compound **37**.¹³C NMR (126 MHz, CDCl₃) of compound **37**.

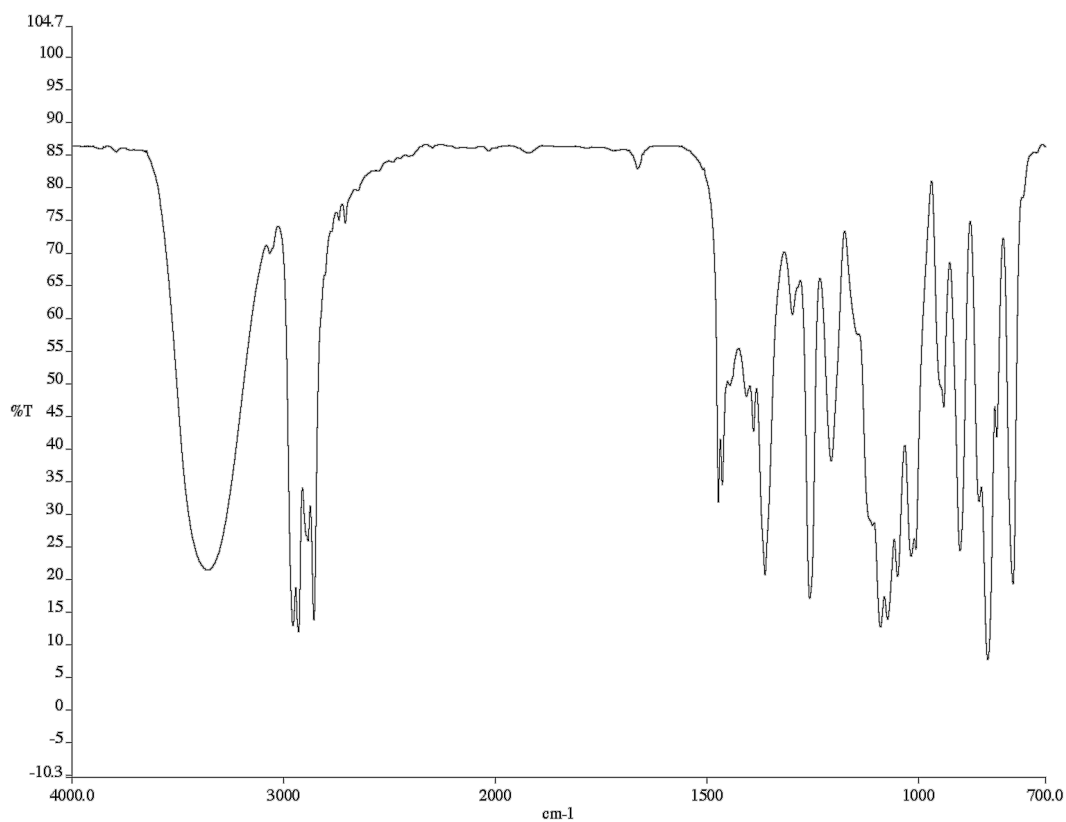


Infrared spectrum (Thin Film, NaCl) of compound **39**.¹³C NMR (101 MHz, CDCl₃) of compound **39**.

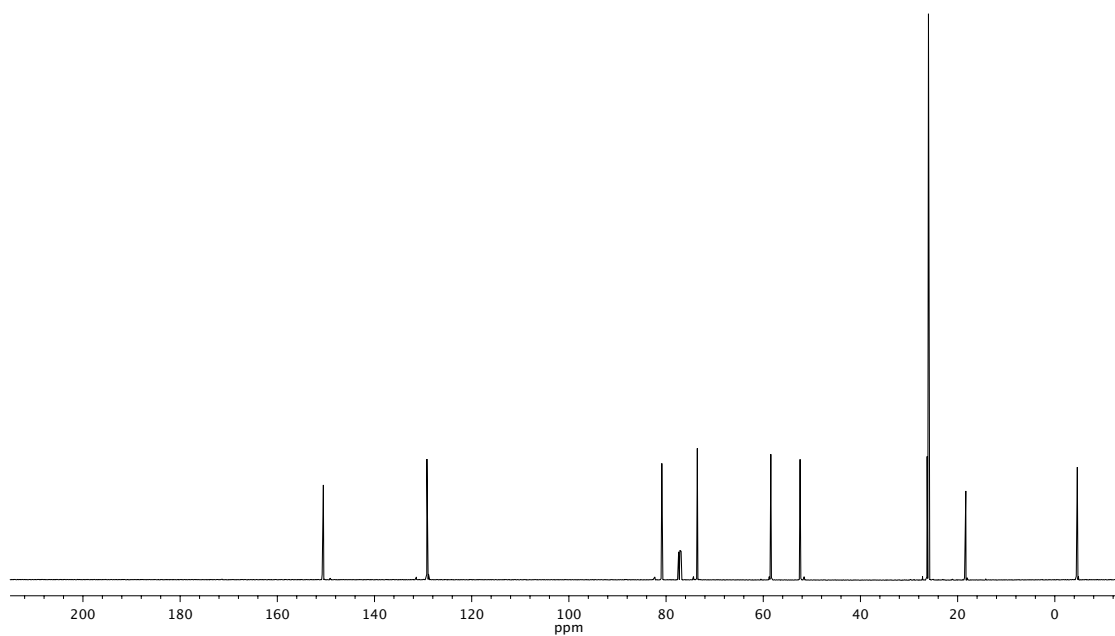




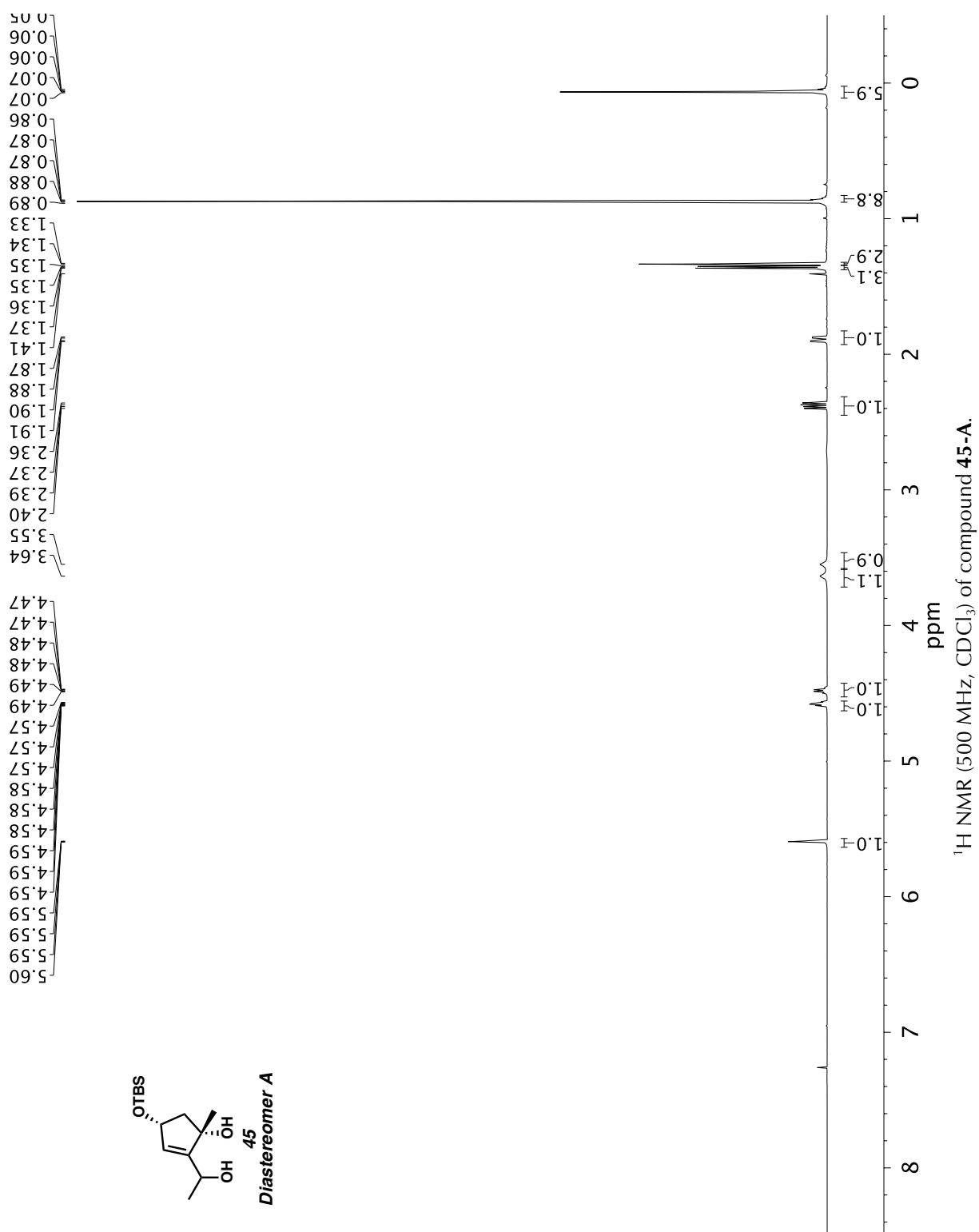


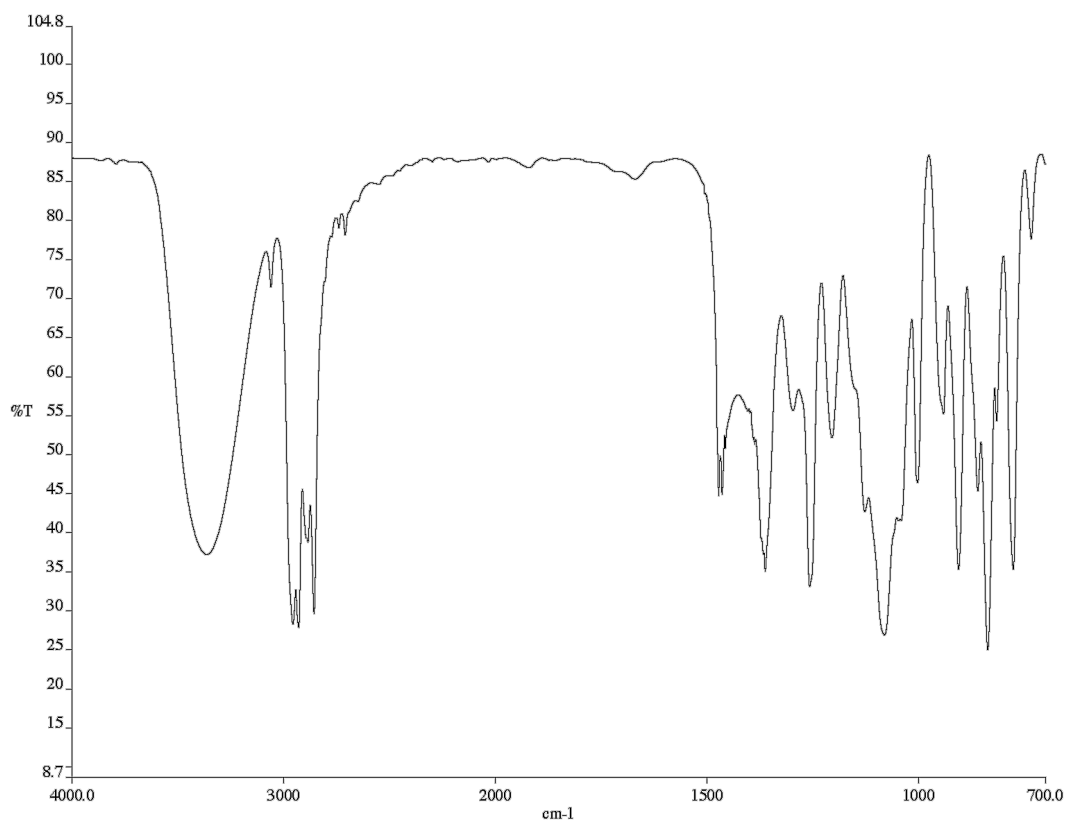


Infrared spectrum (Thin Film, NaCl) of compound **44**.

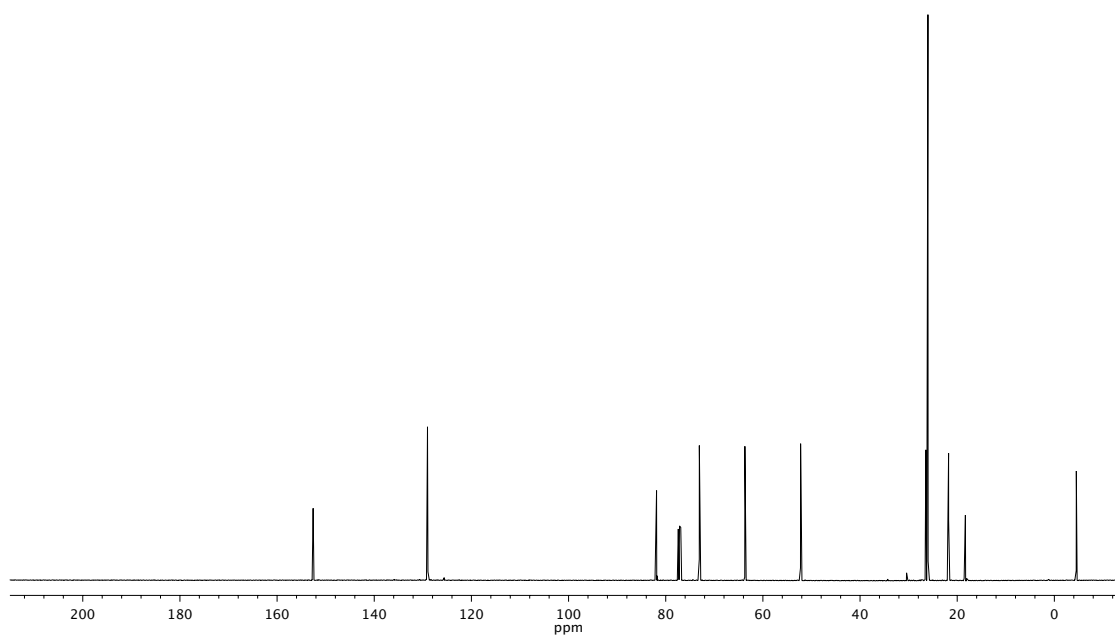


¹³C NMR (126 MHz, CDCl₃) of compound **44**.

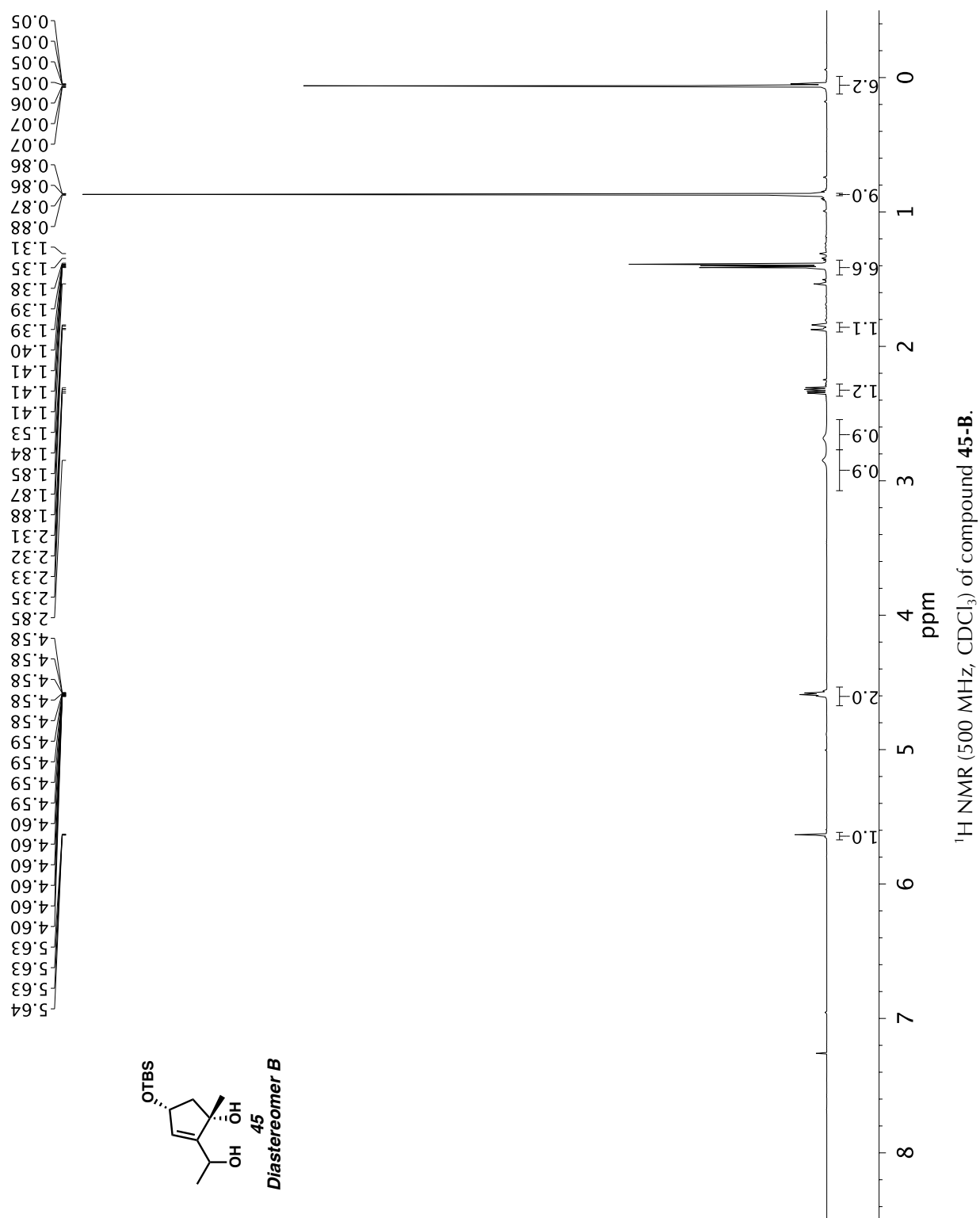


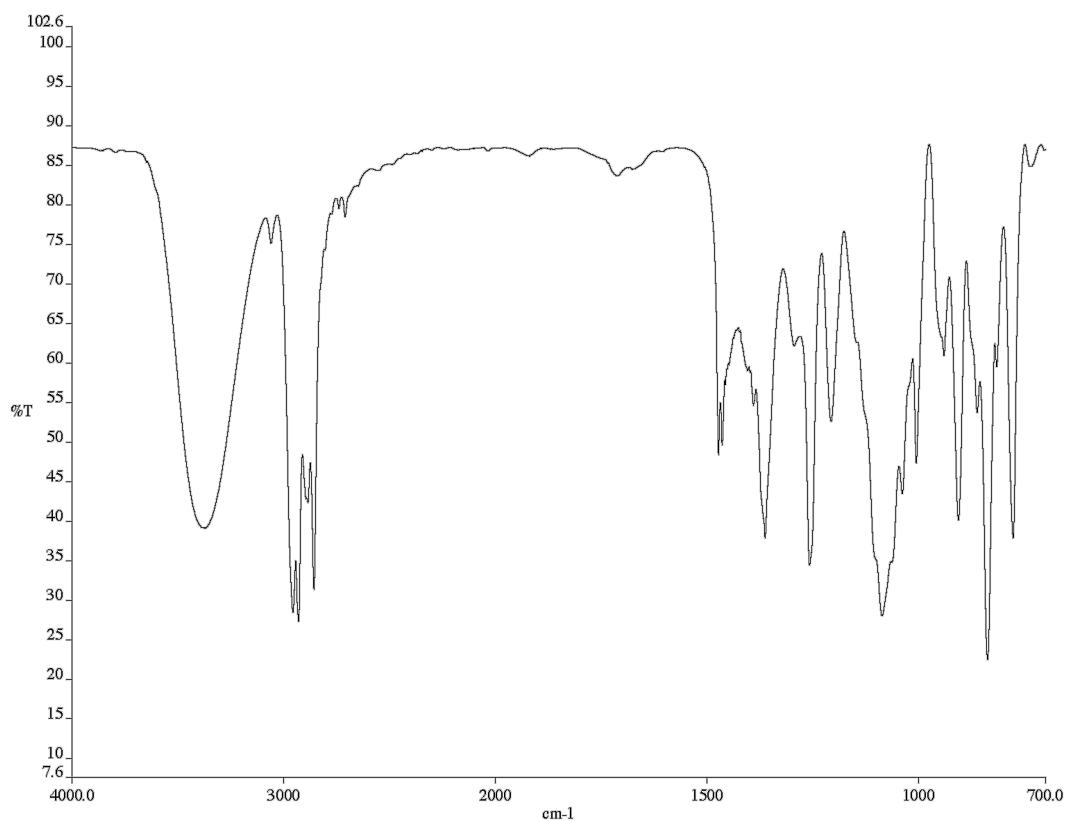
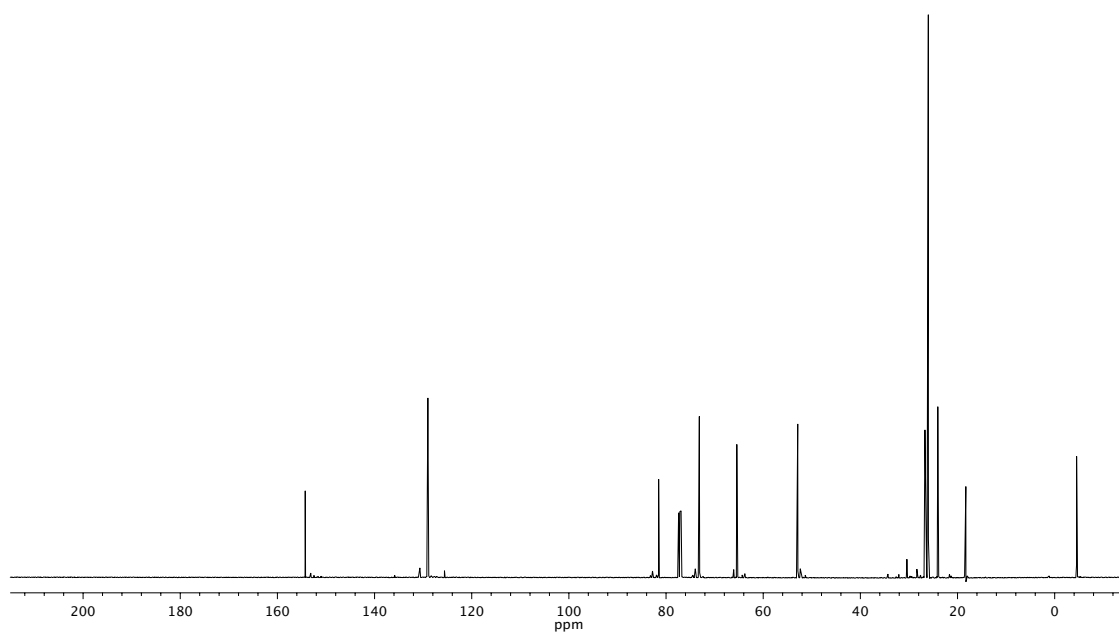


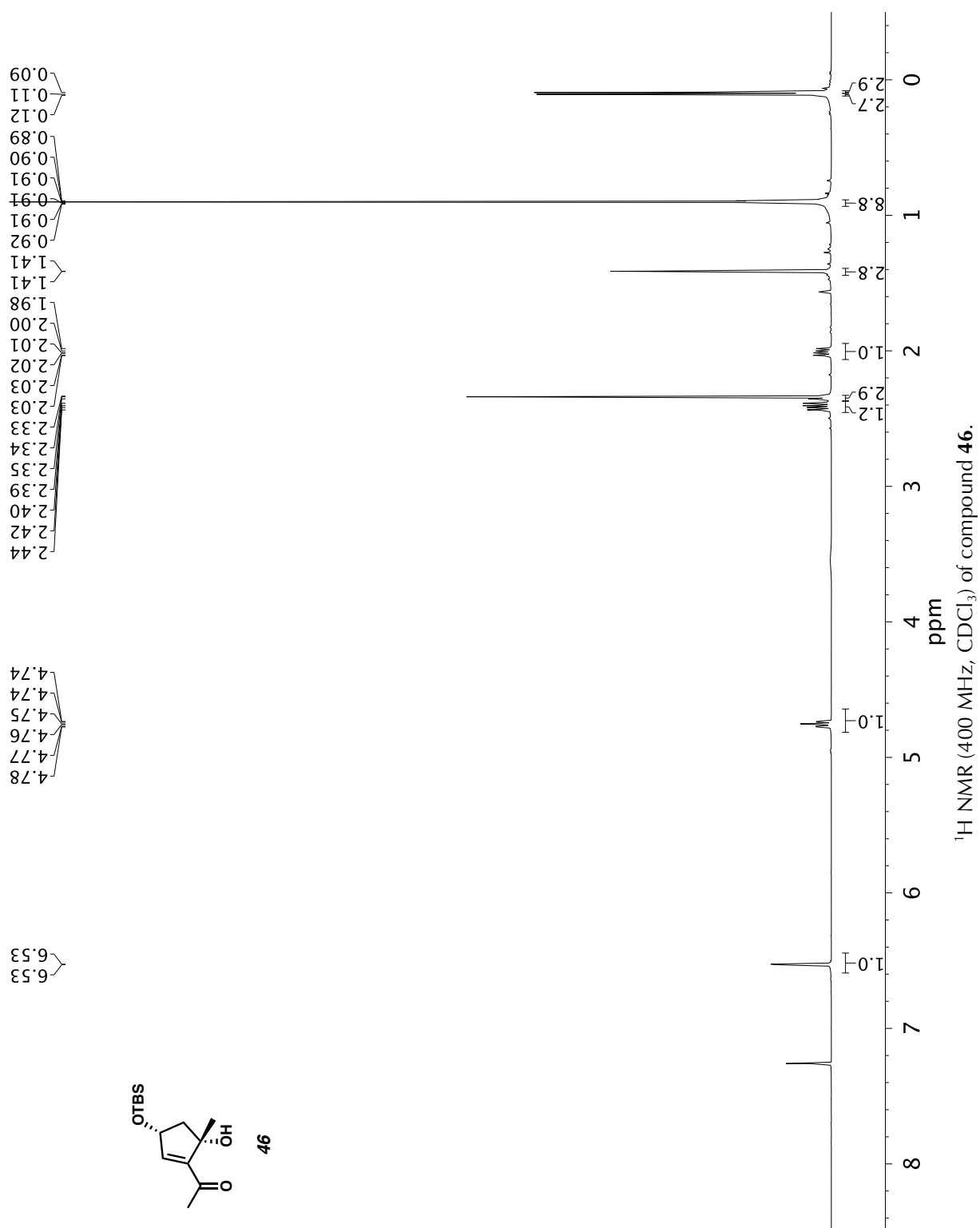
Infrared spectrum (Thin Film, NaCl) of compound **45-A**.

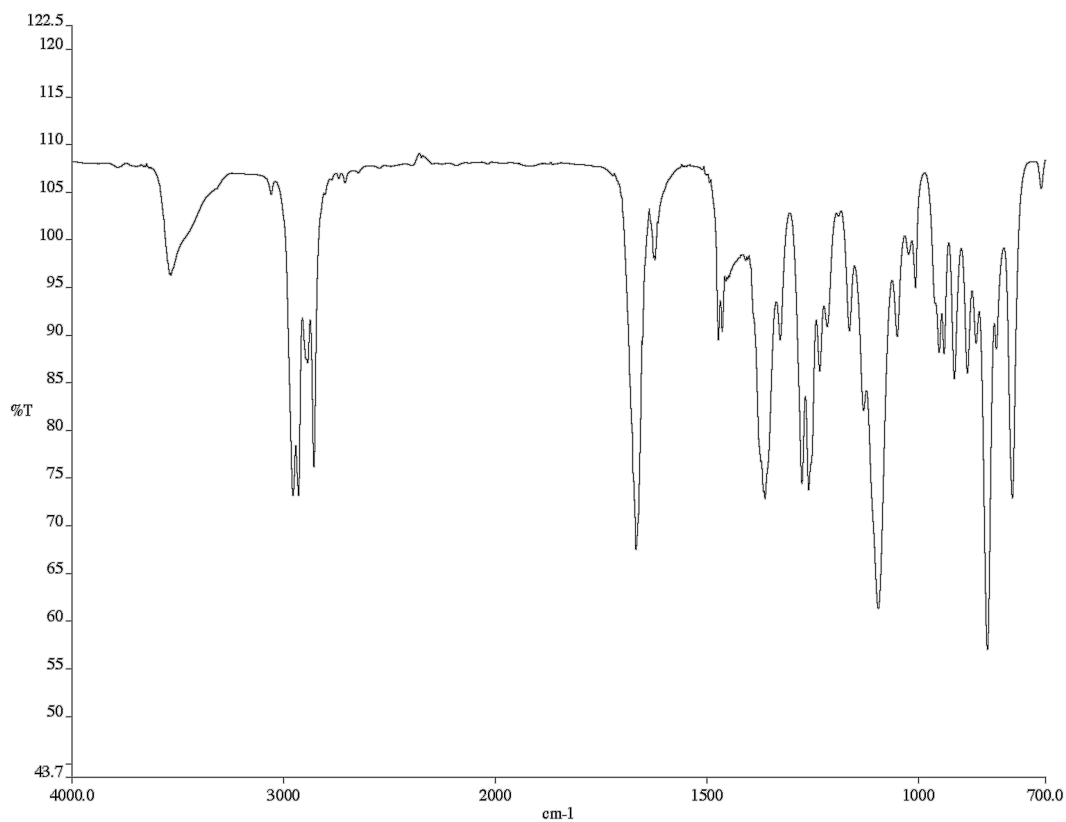
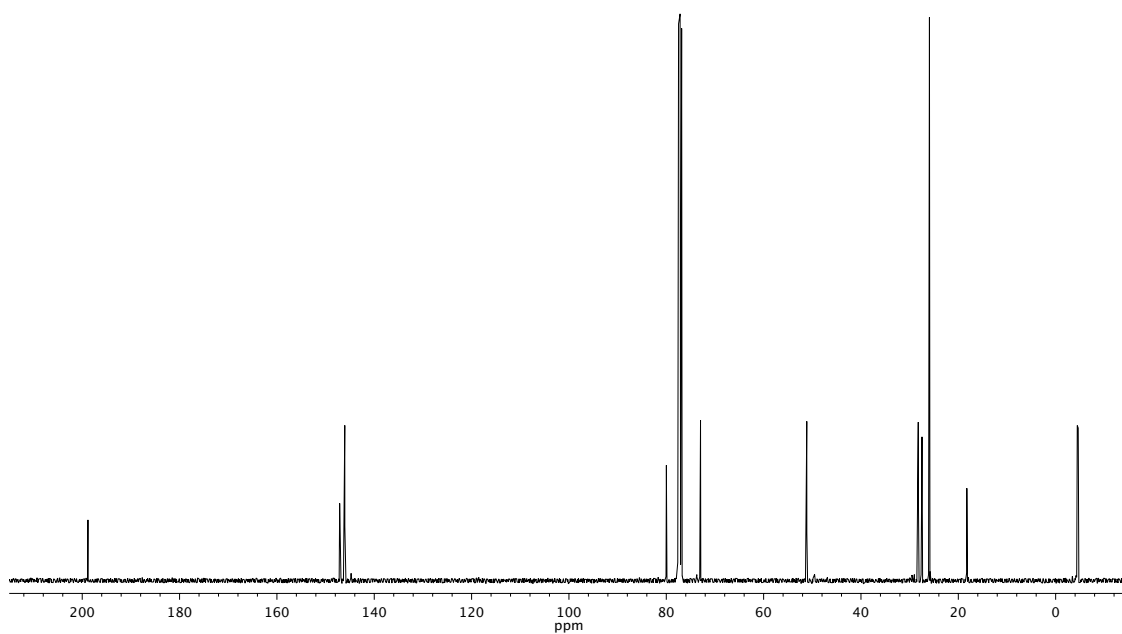


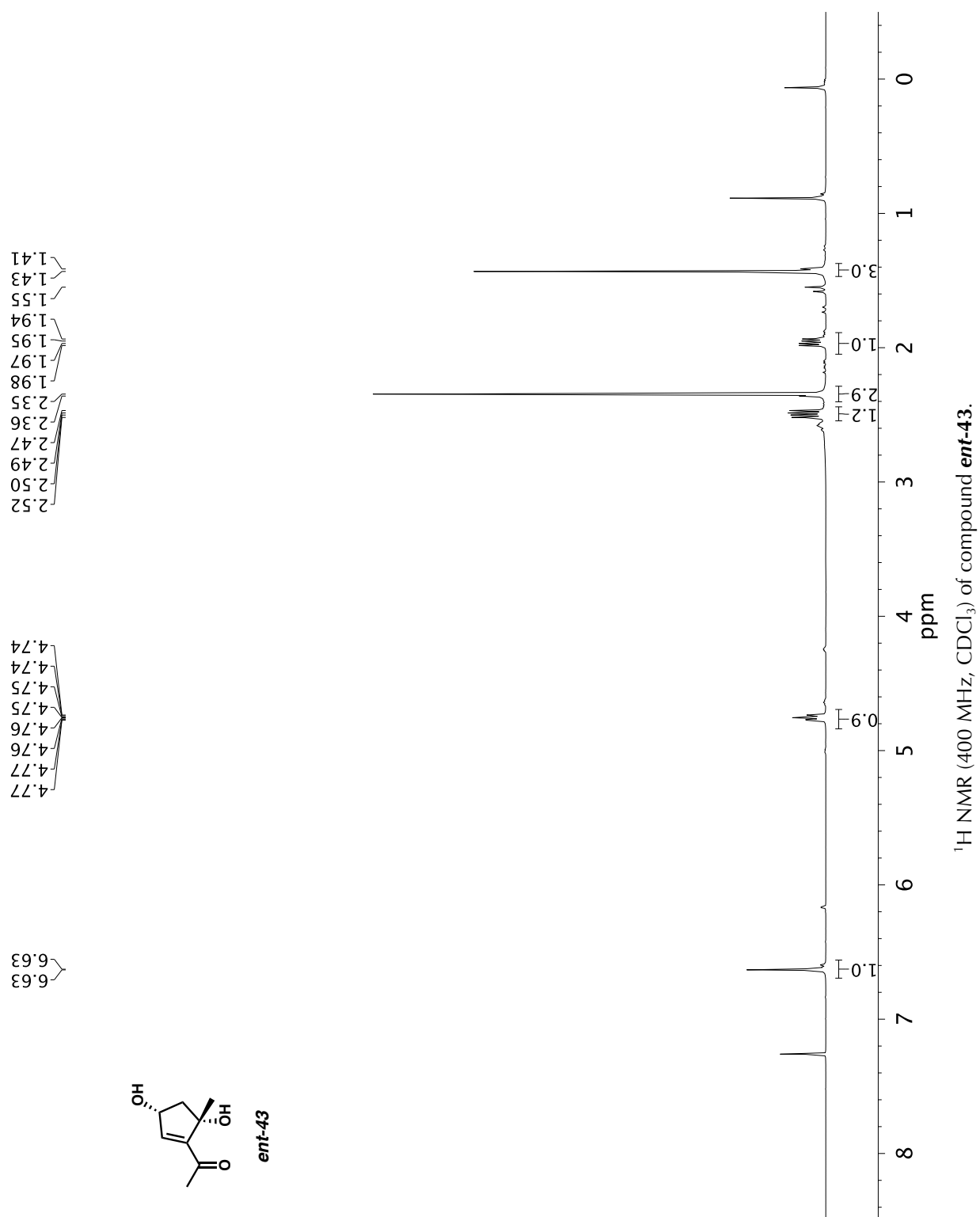
^{13}C NMR (126 MHz, CDCl_3) of compound **45-A**.

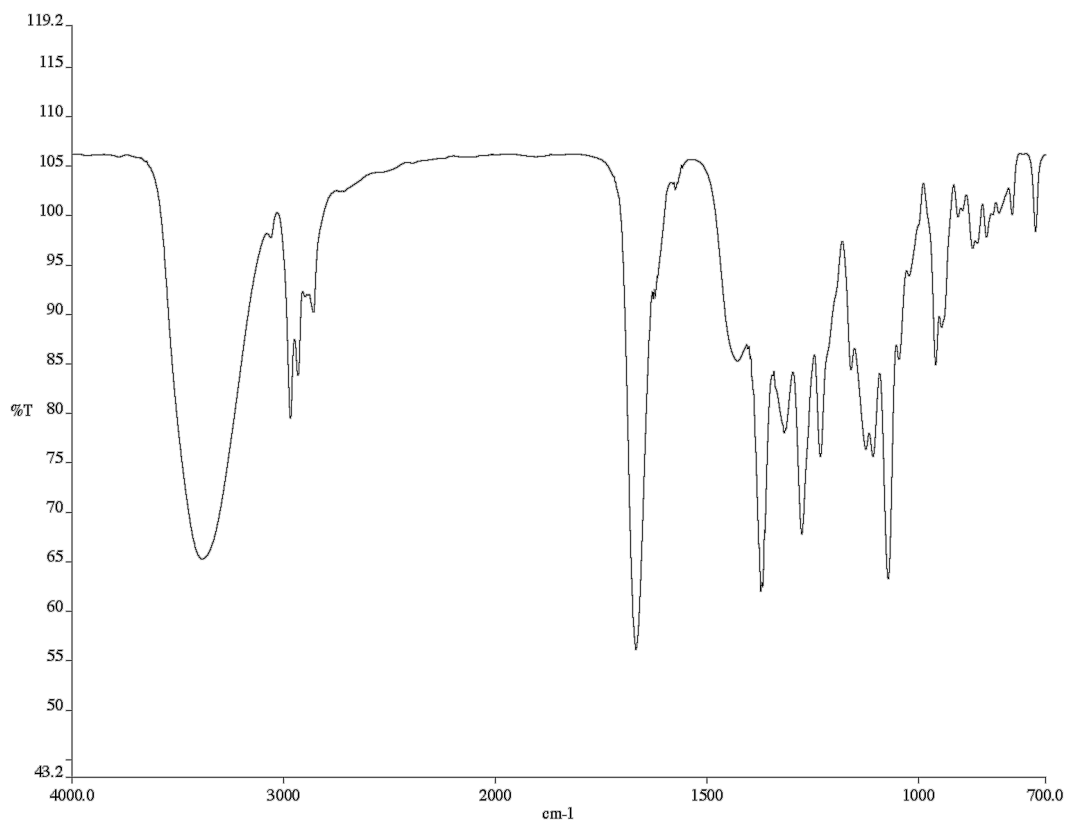
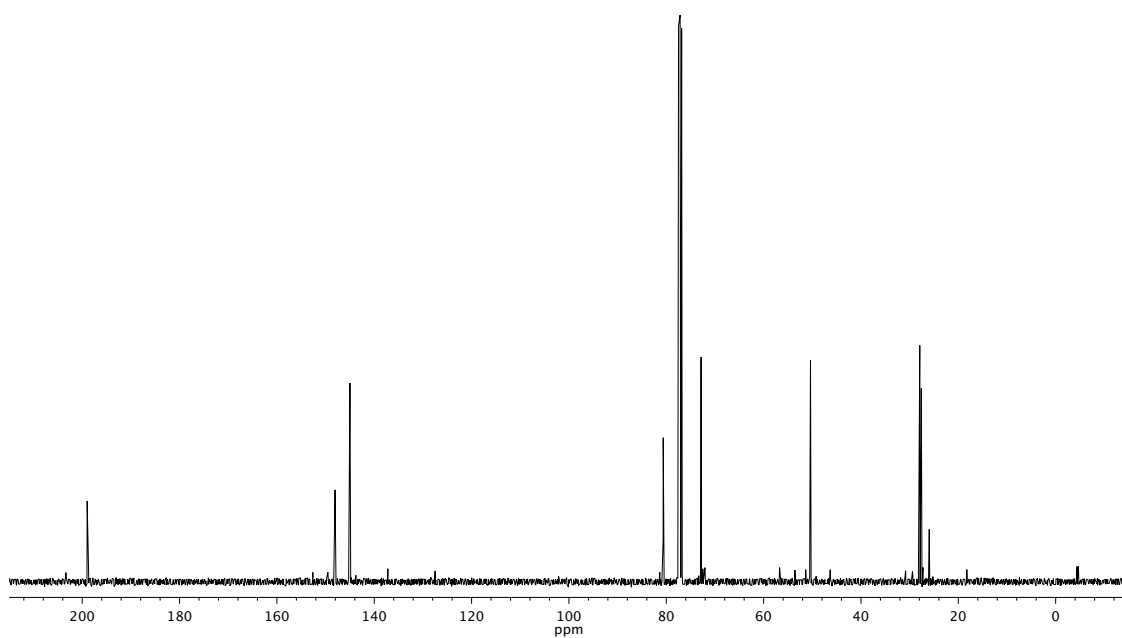


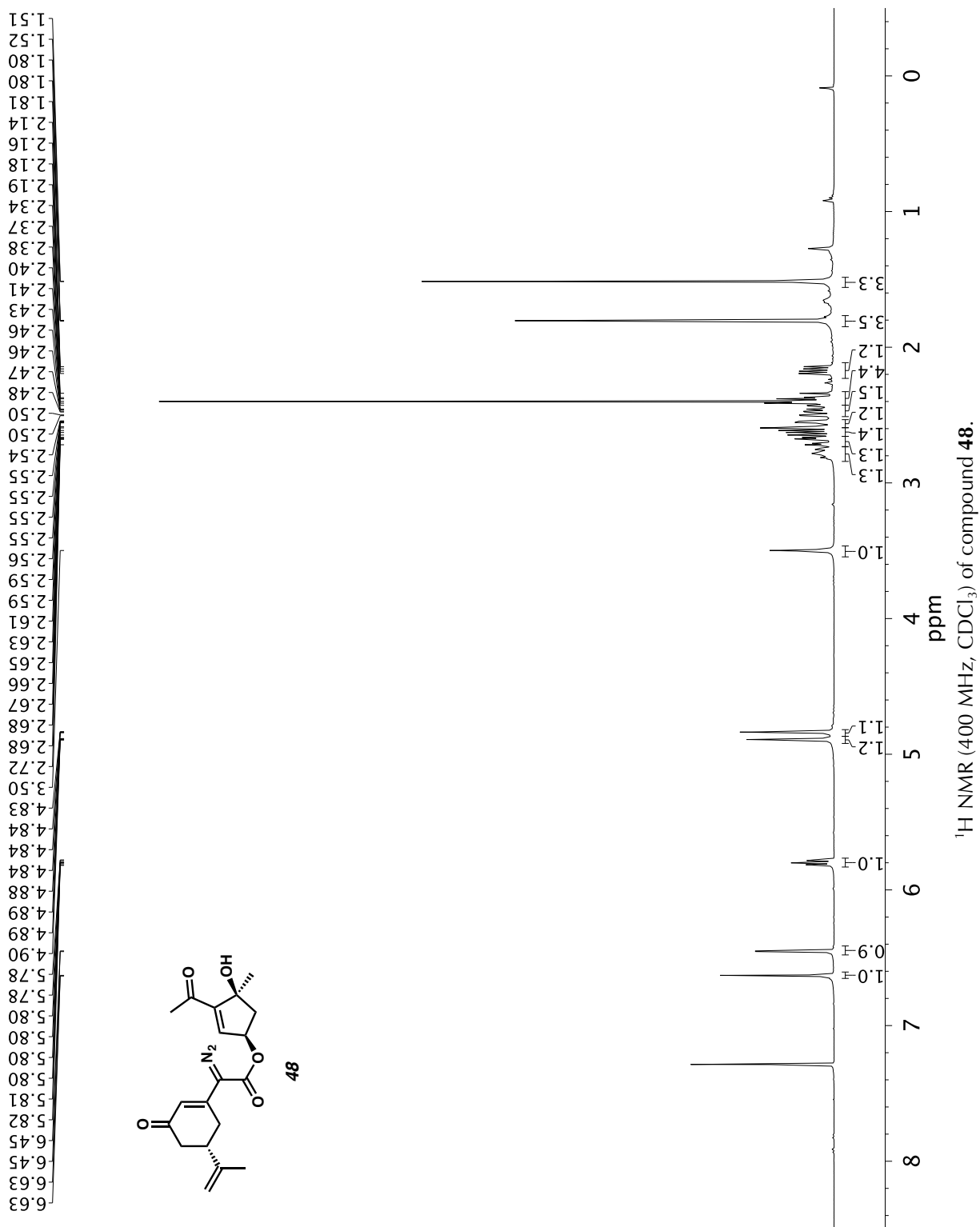
Infrared spectrum (Thin Film, NaCl) of compound **45-B**.¹³C NMR (126 MHz, CDCl₃) of compound **45-B**.

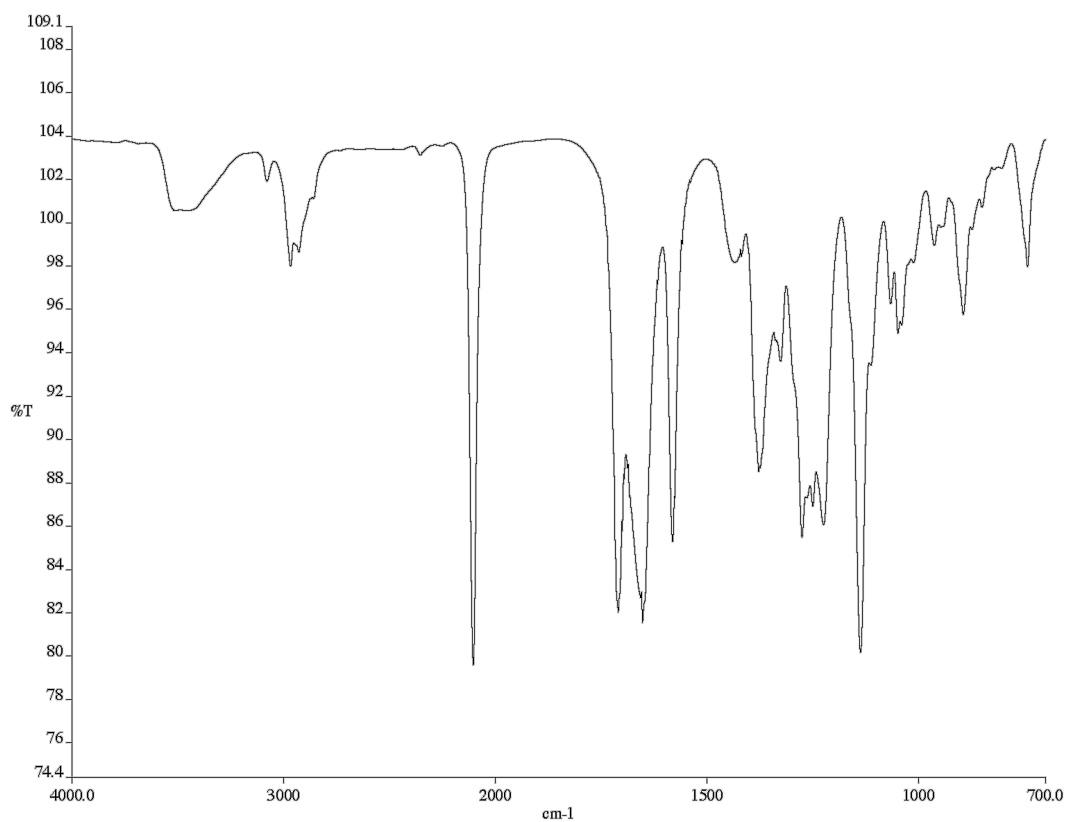
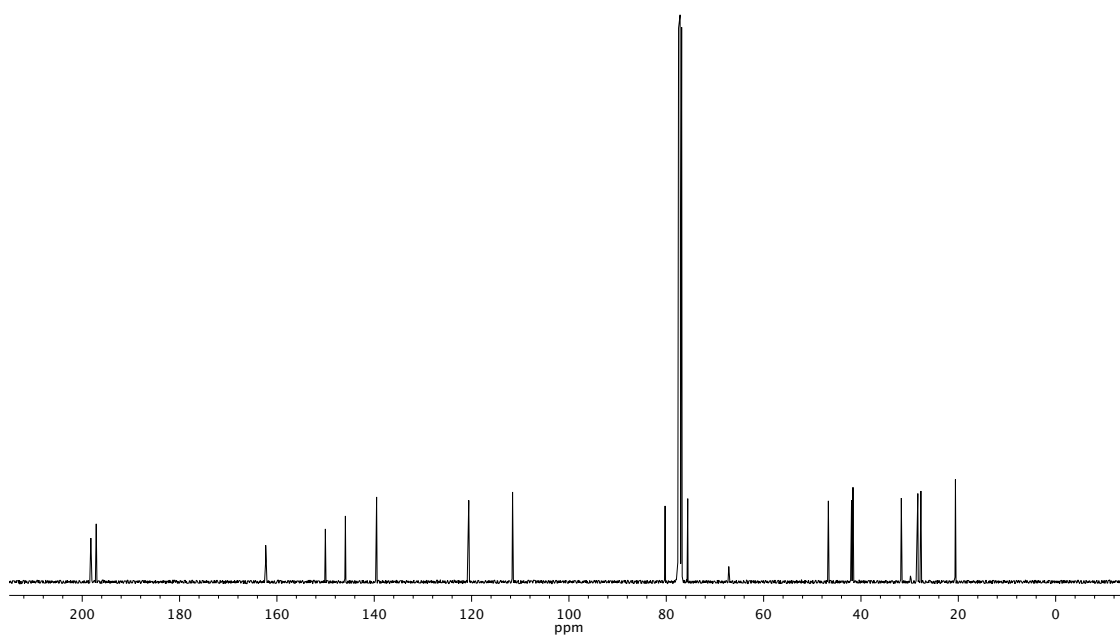


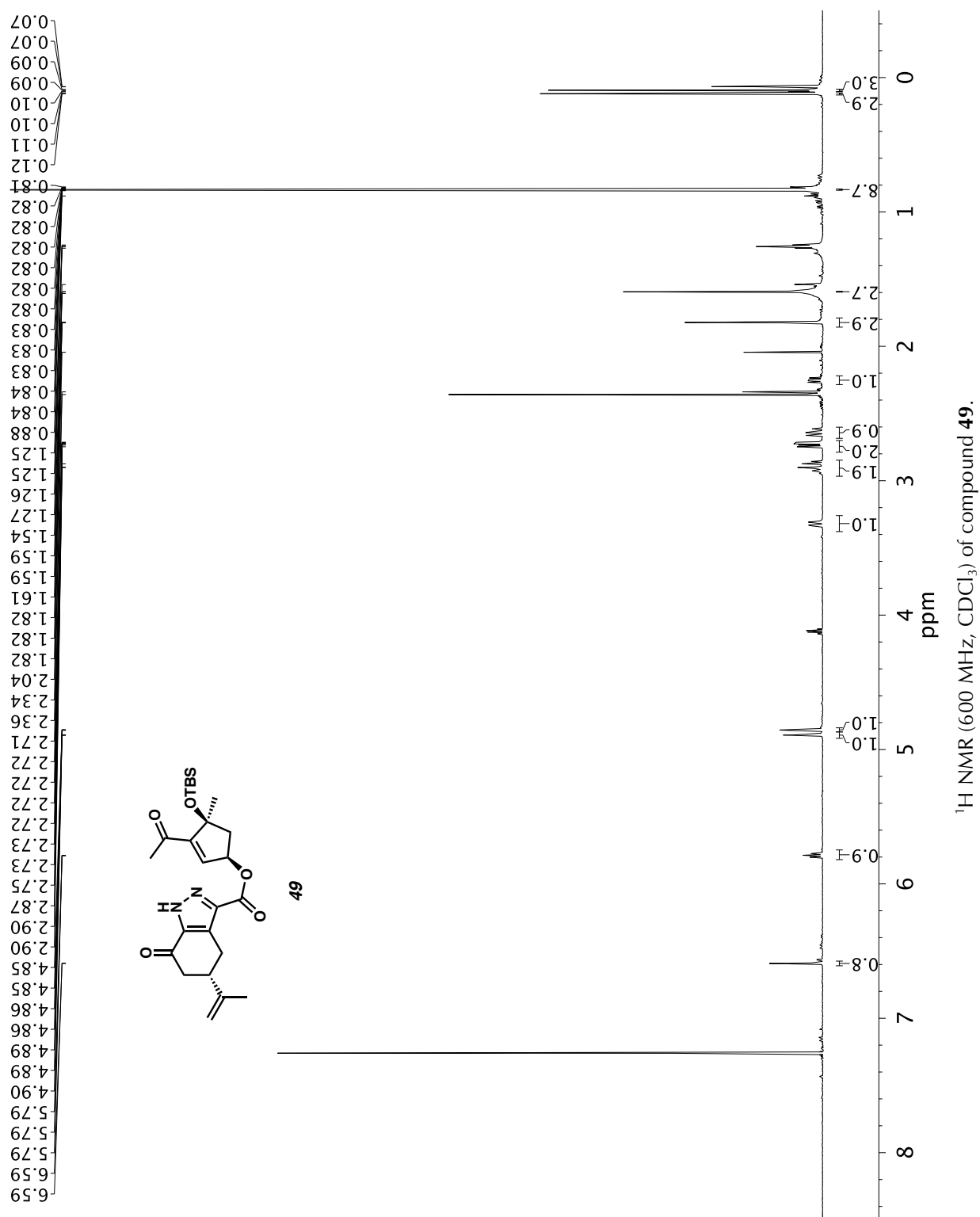
Infrared spectrum (Thin Film, NaCl) of compound **46**.¹³C NMR (101 MHz, CDCl₃) of compound **46**.

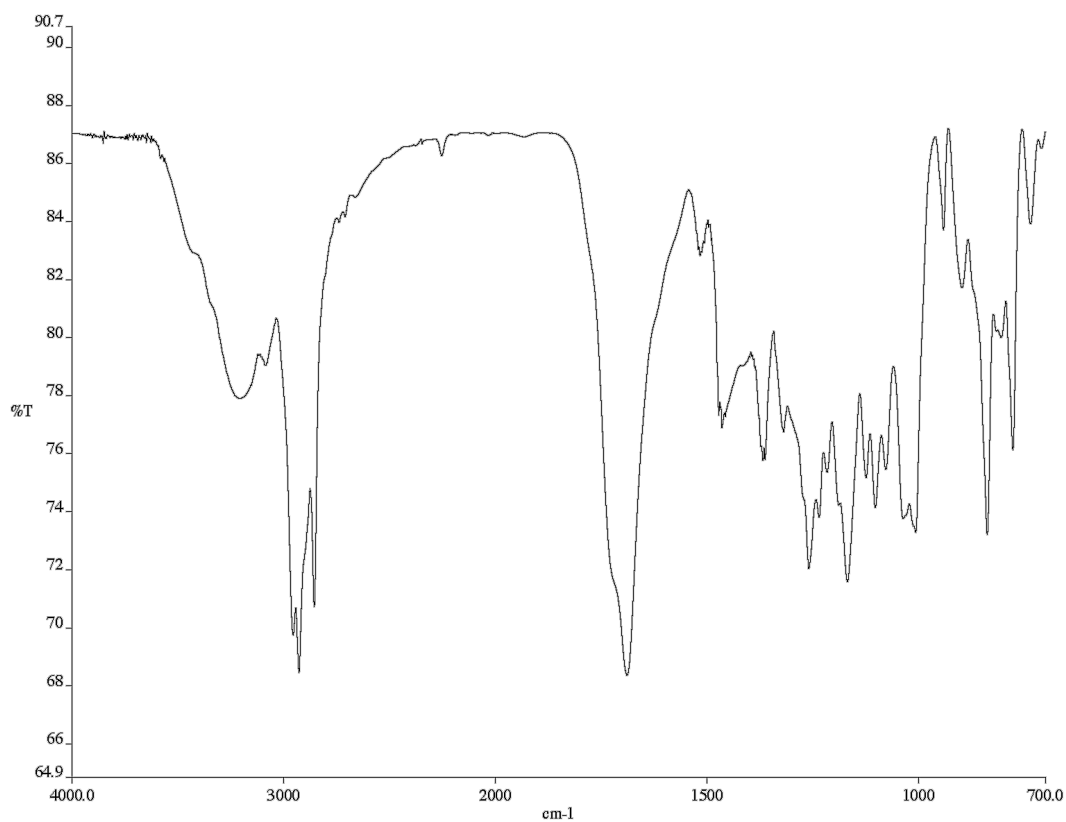
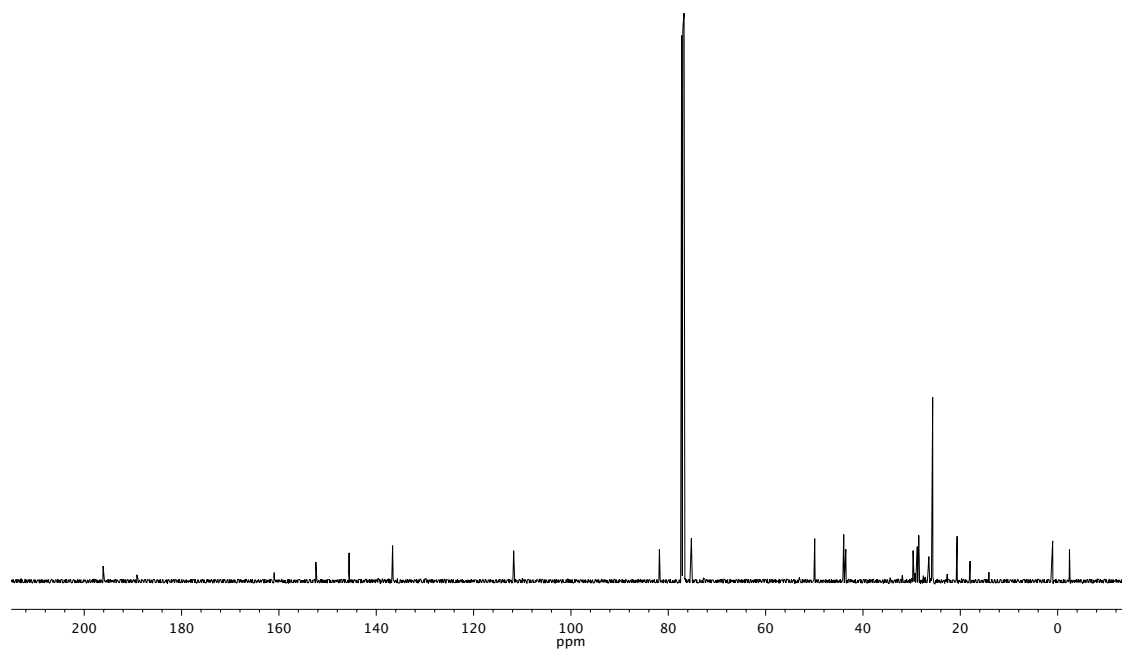


Infrared spectrum (Thin Film, NaCl) of compound **ent-43**.¹³C NMR (101 MHz, CDCl₃) of compound **ent-43**.

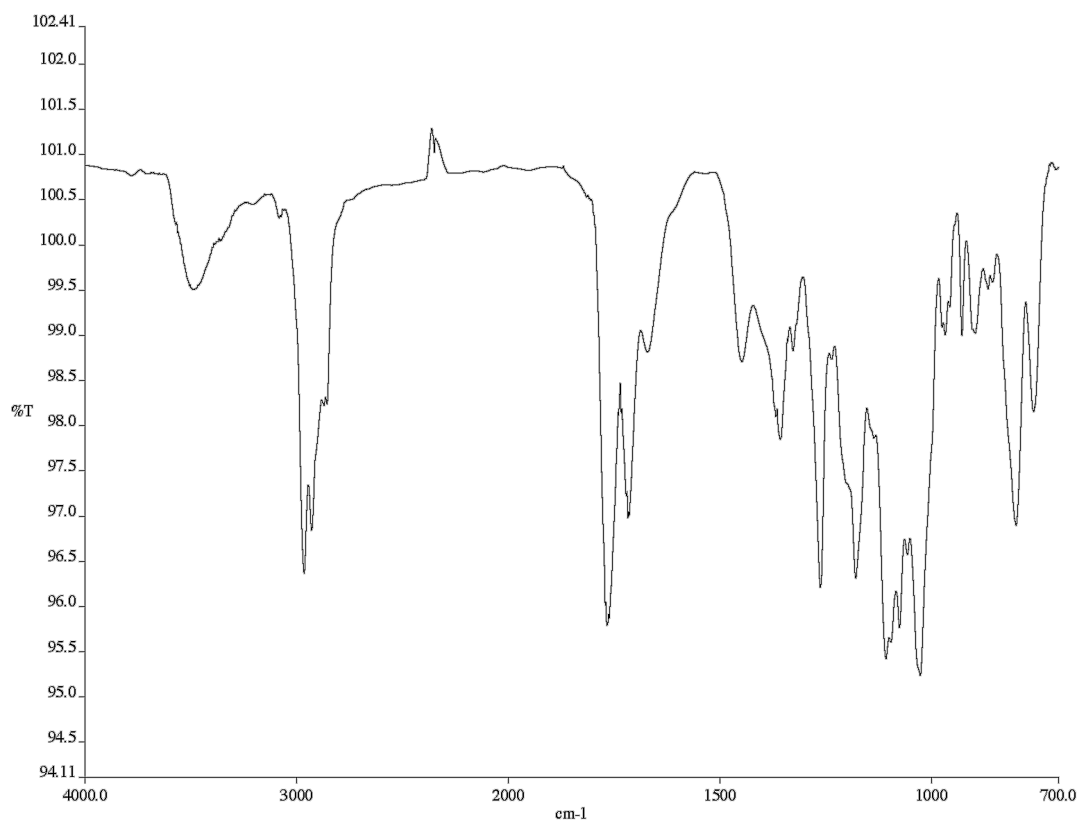


Infrared spectrum (Thin Film, NaCl) of compound **48**.¹³C NMR (101 MHz, CDCl₃) of compound **48**.

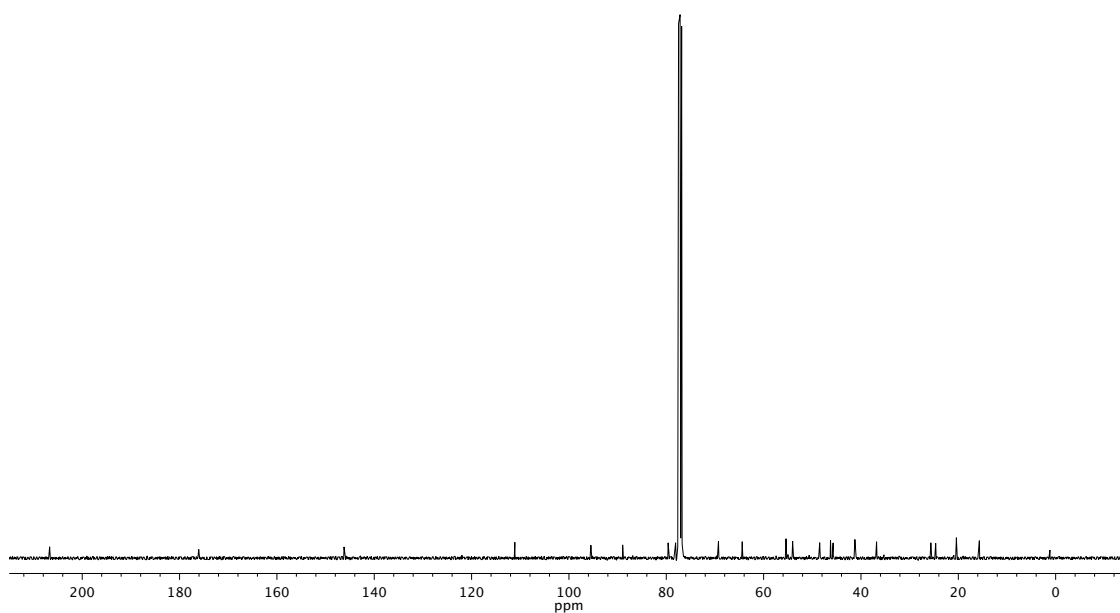


Infrared spectrum (Thin Film, NaCl) of compound **49**.¹³C NMR (126 MHz, CDCl₃) of compound **49**.



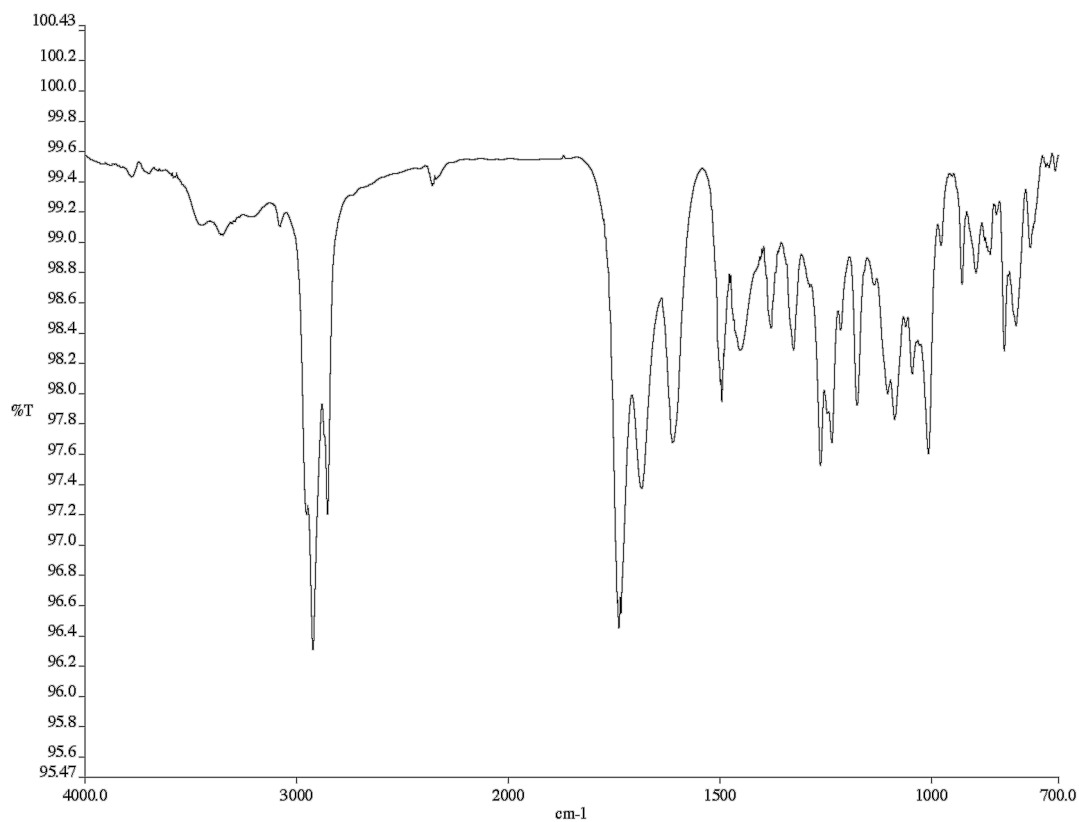
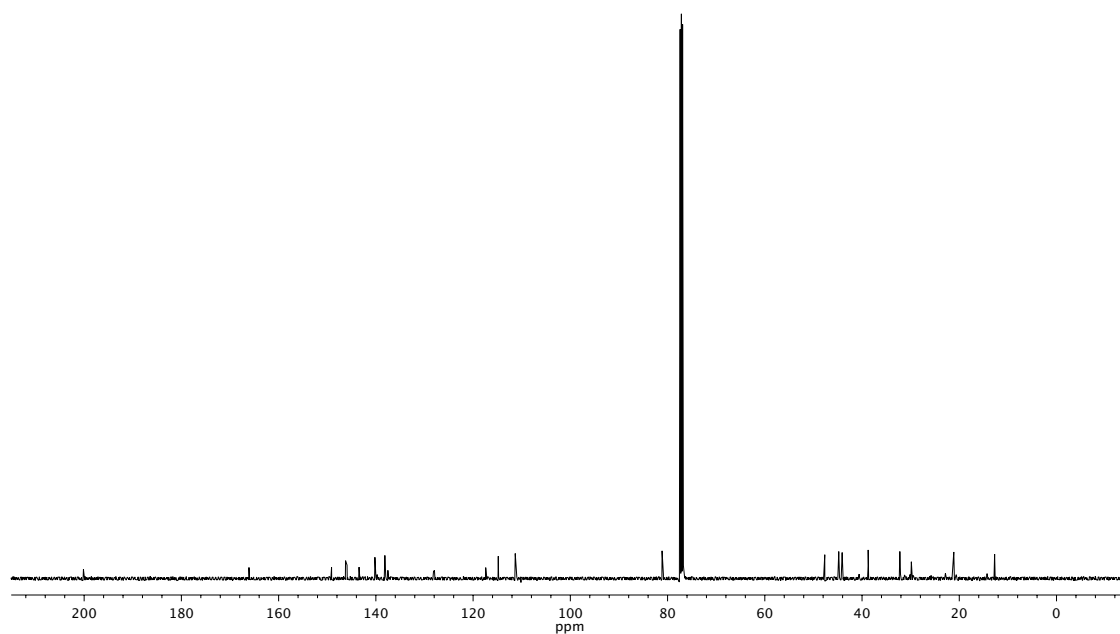


Infrared spectrum (Thin Film, NaCl) of compound **52**.

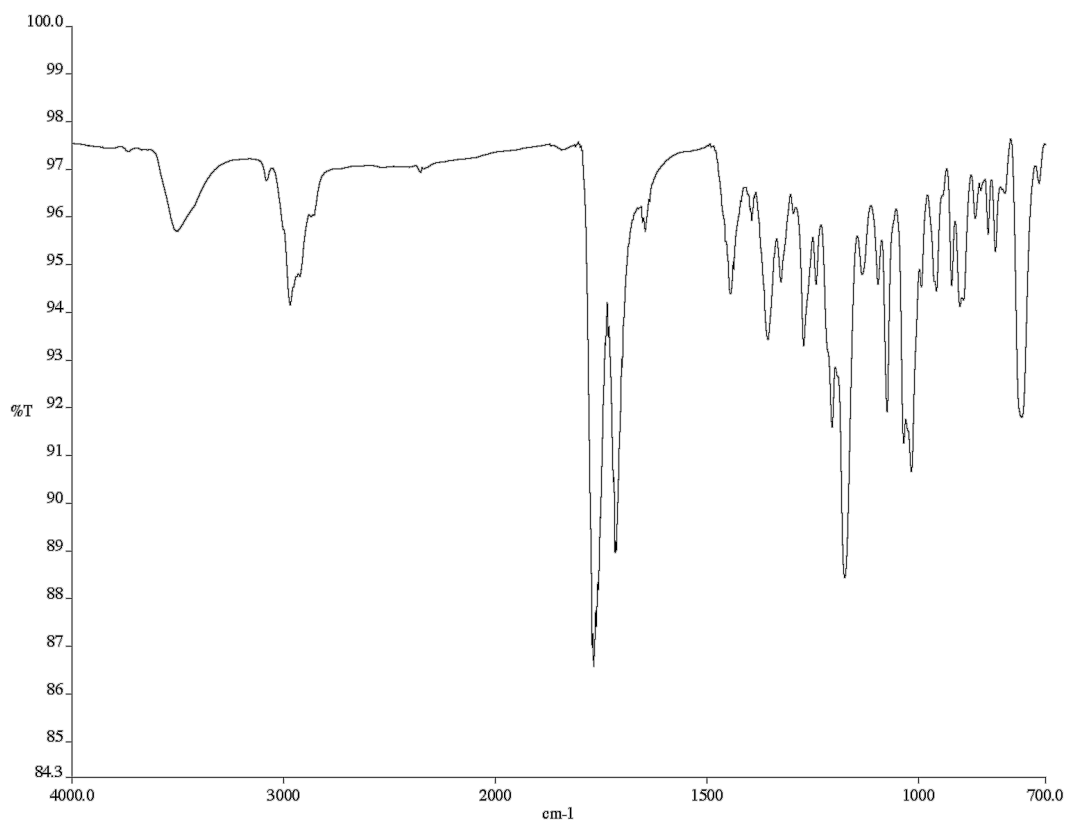
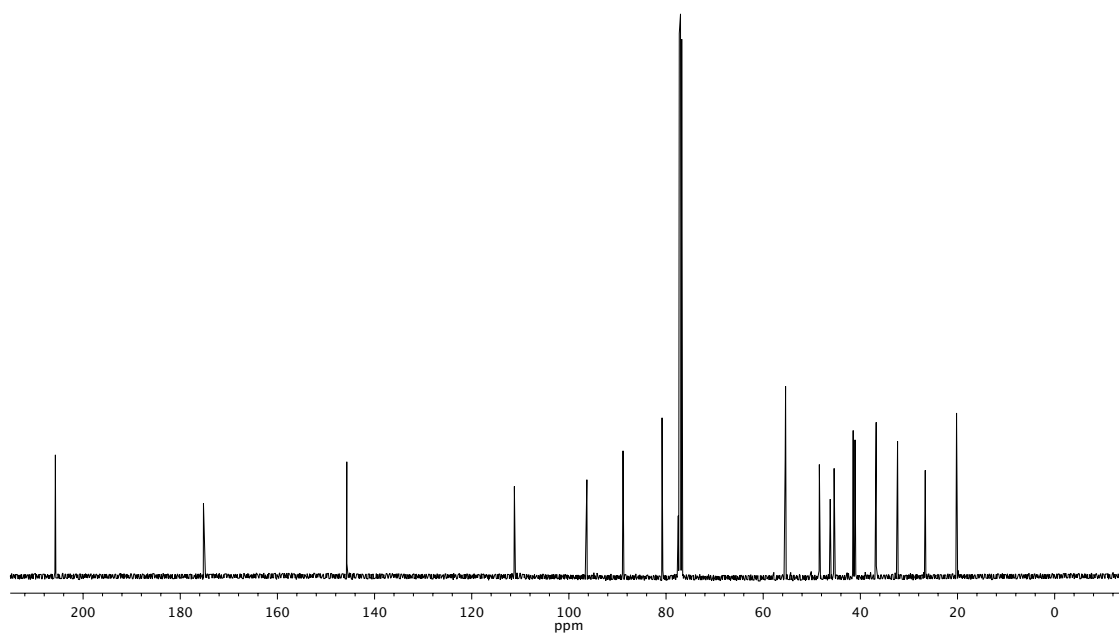


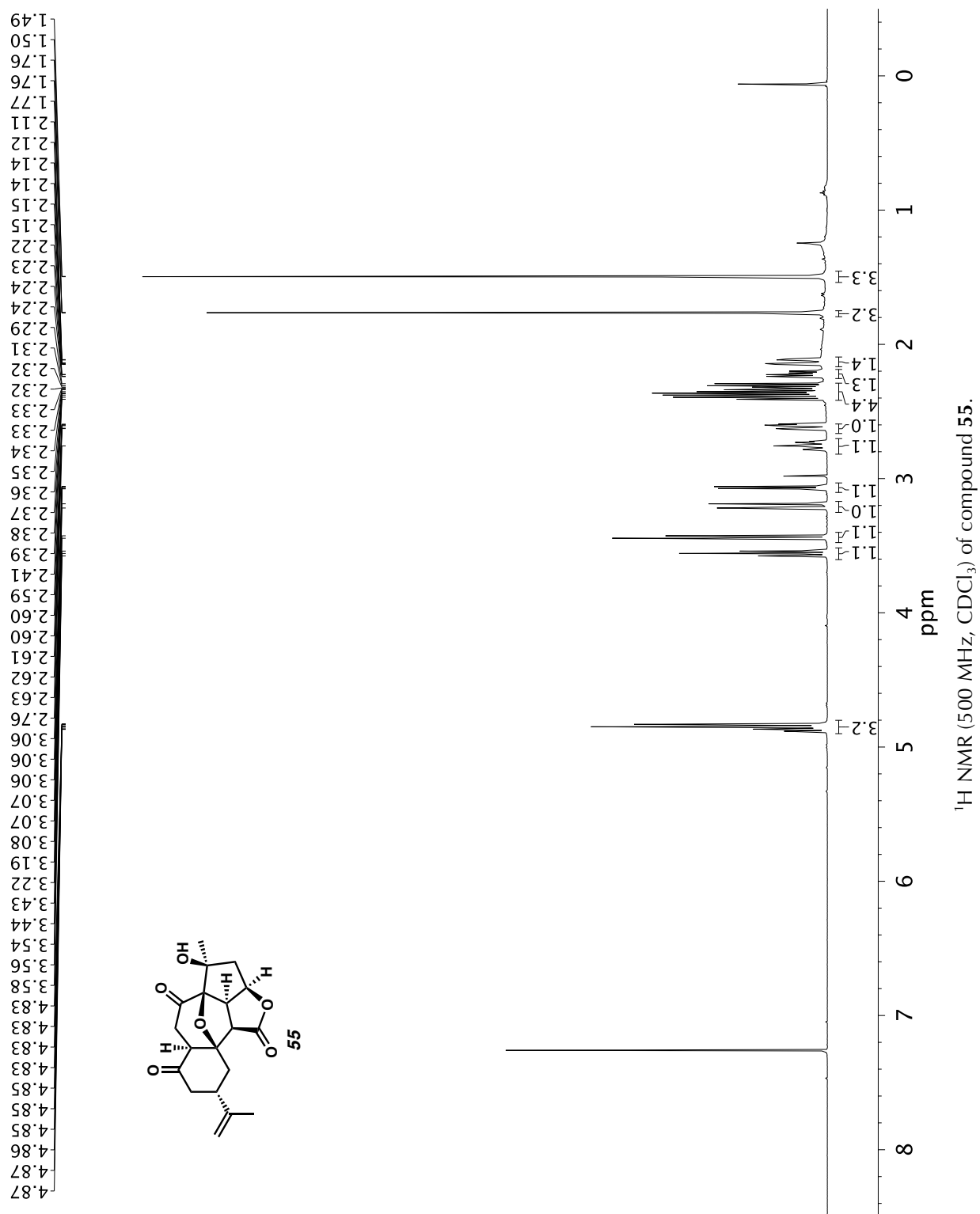
¹³C NMR (101 MHz, CDCl₃) of compound **52**.

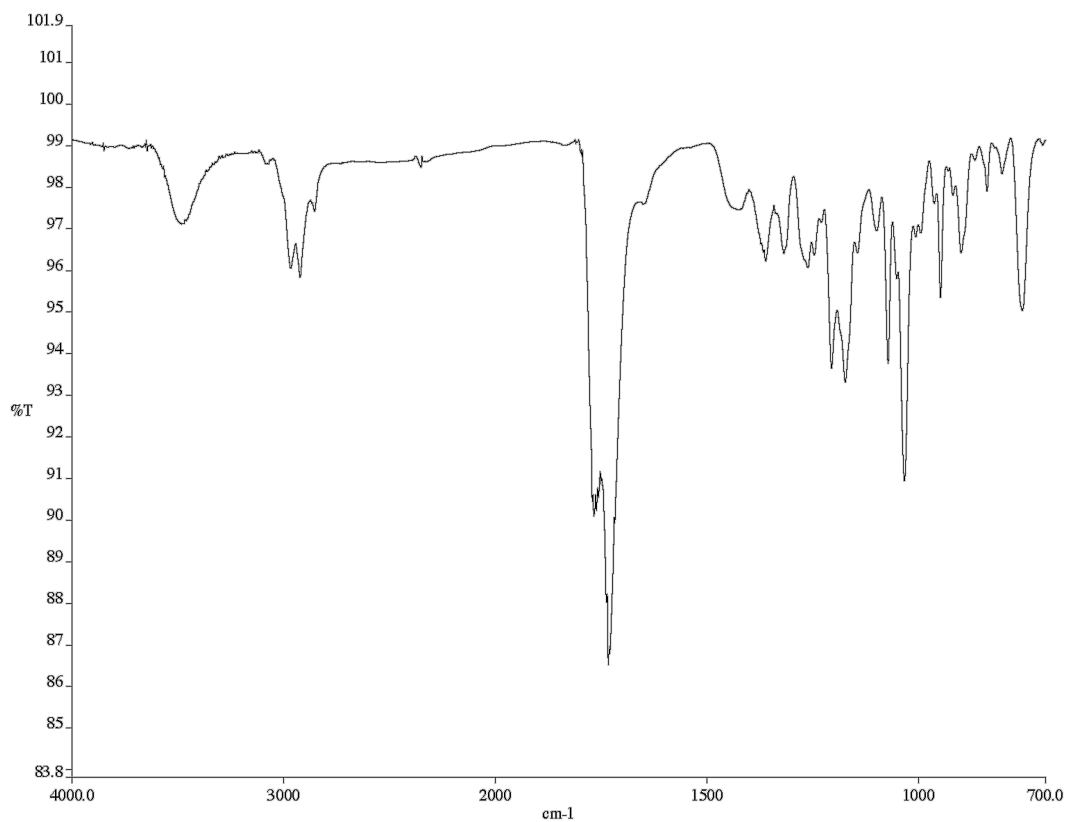
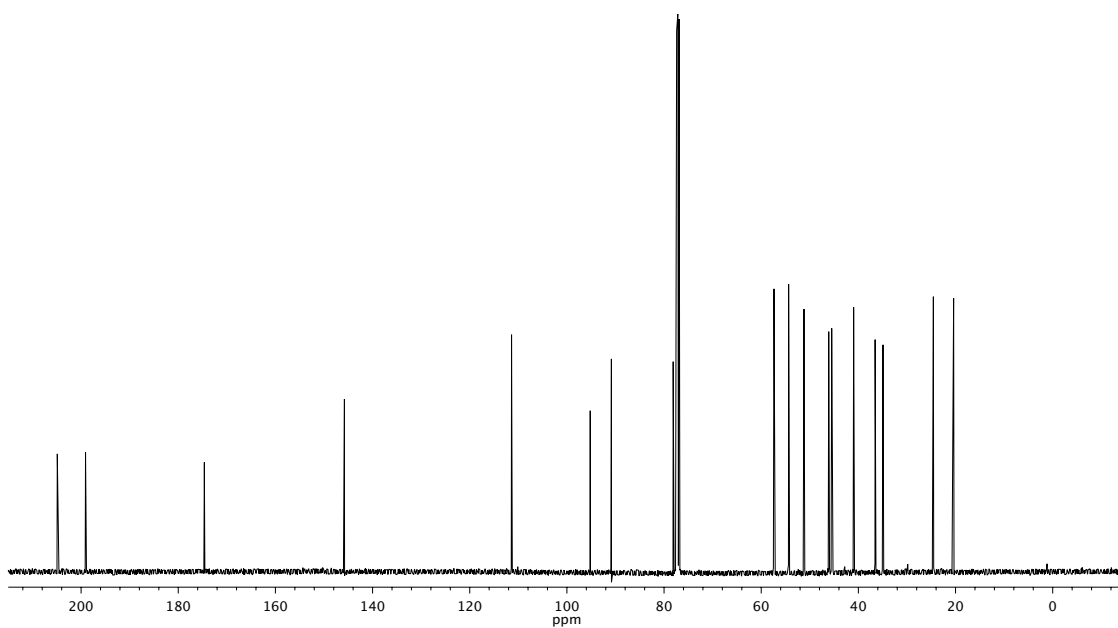


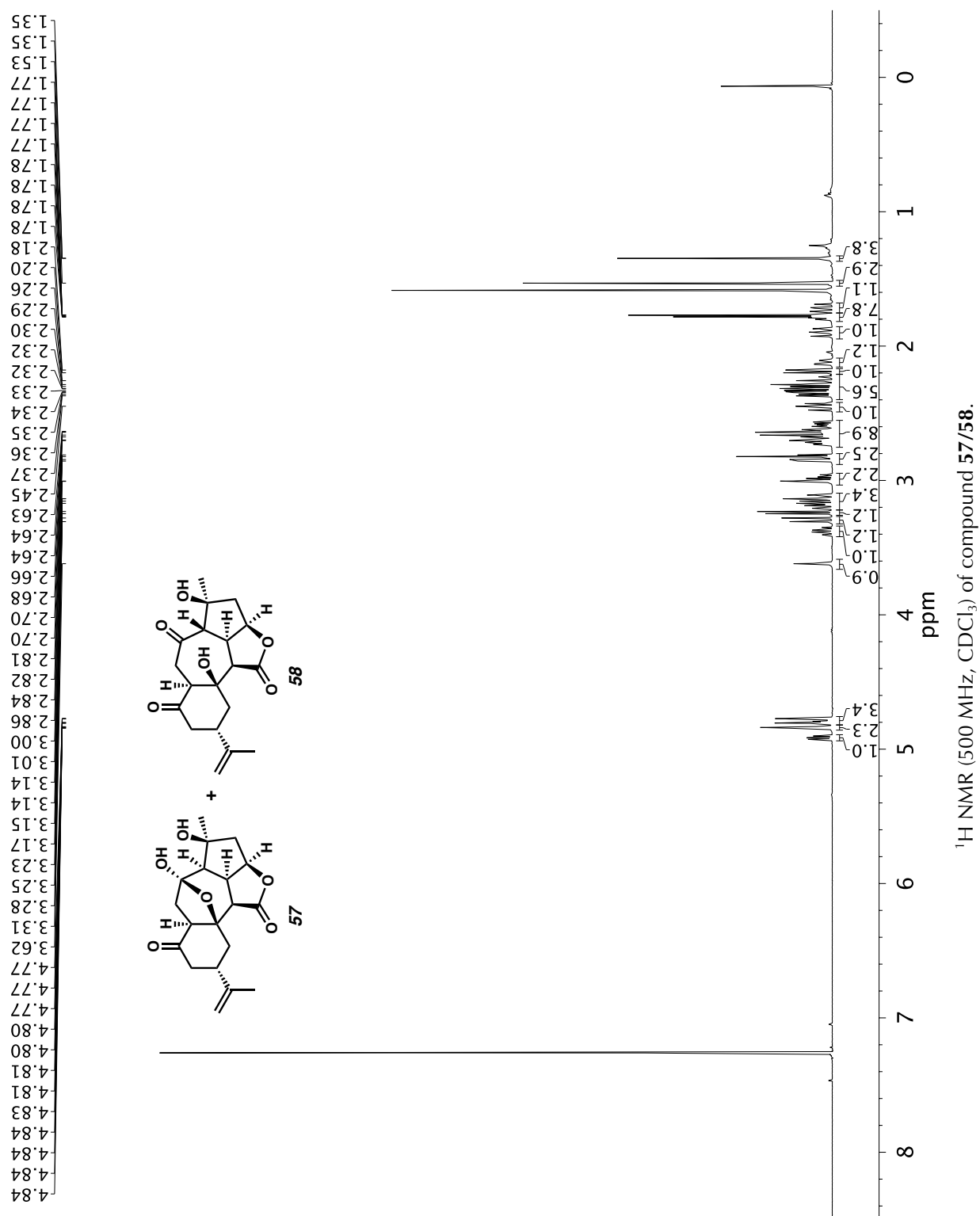
Infrared spectrum (Thin Film, NaCl) of compound **53**.¹³C NMR (126 MHz, CDCl₃) of compound **53**.

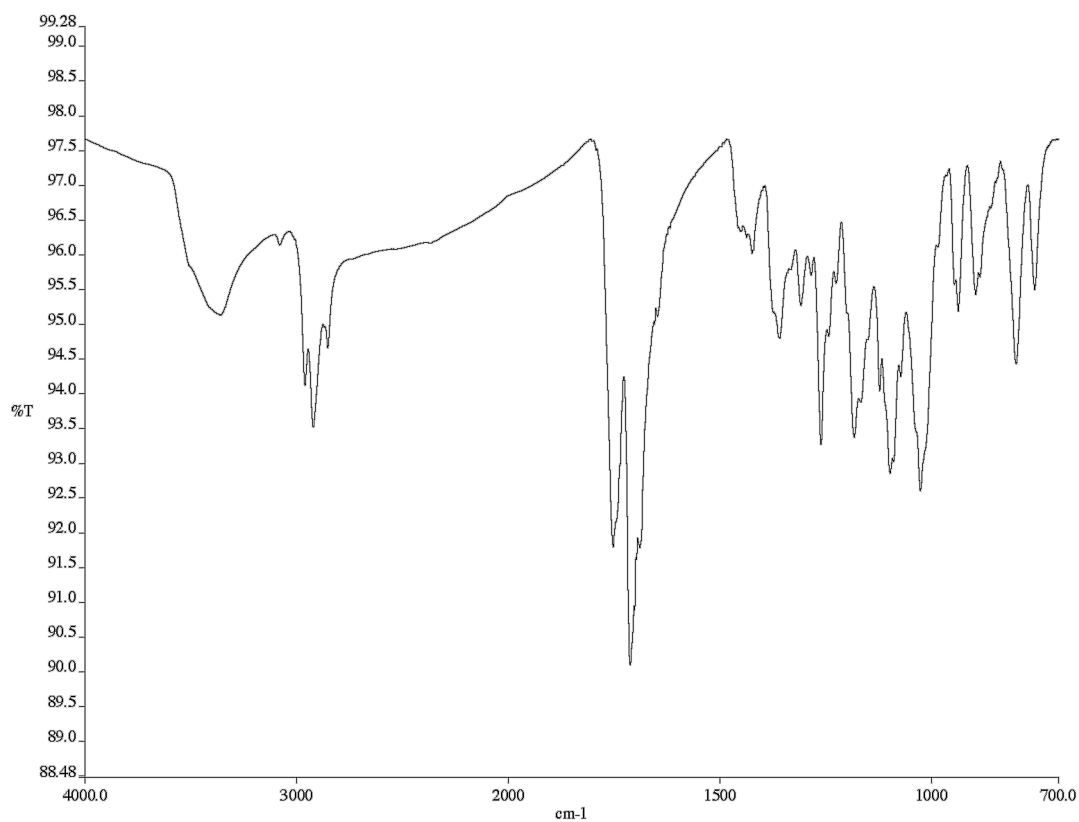
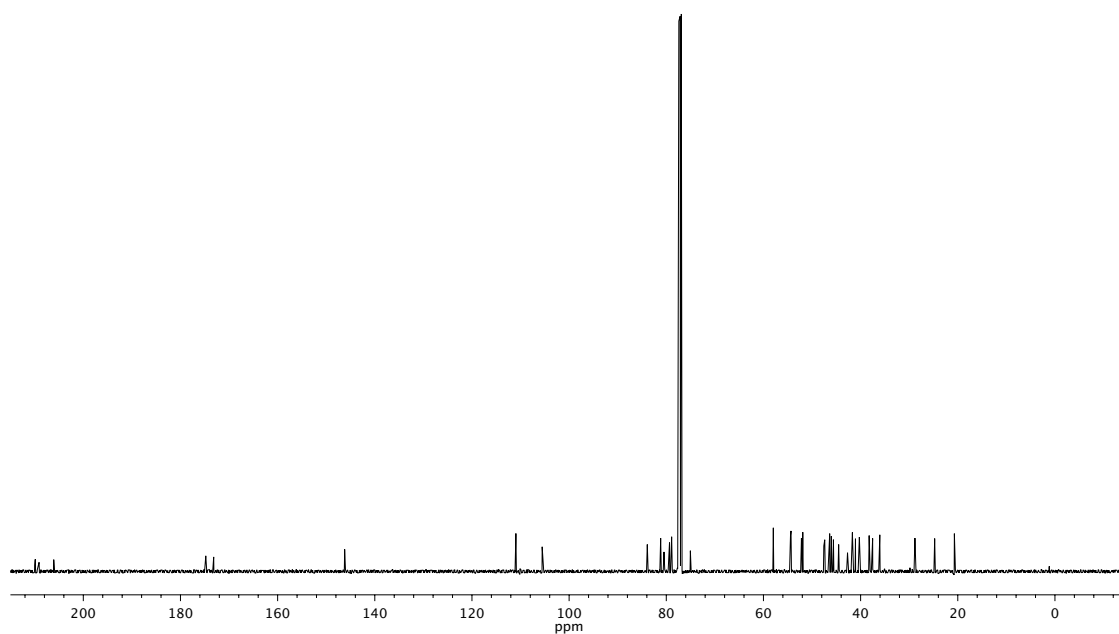


Infrared spectrum (Thin Film, NaCl) of compound **54**.¹³C NMR (126 MHz, CDCl₃) of compound **54**.

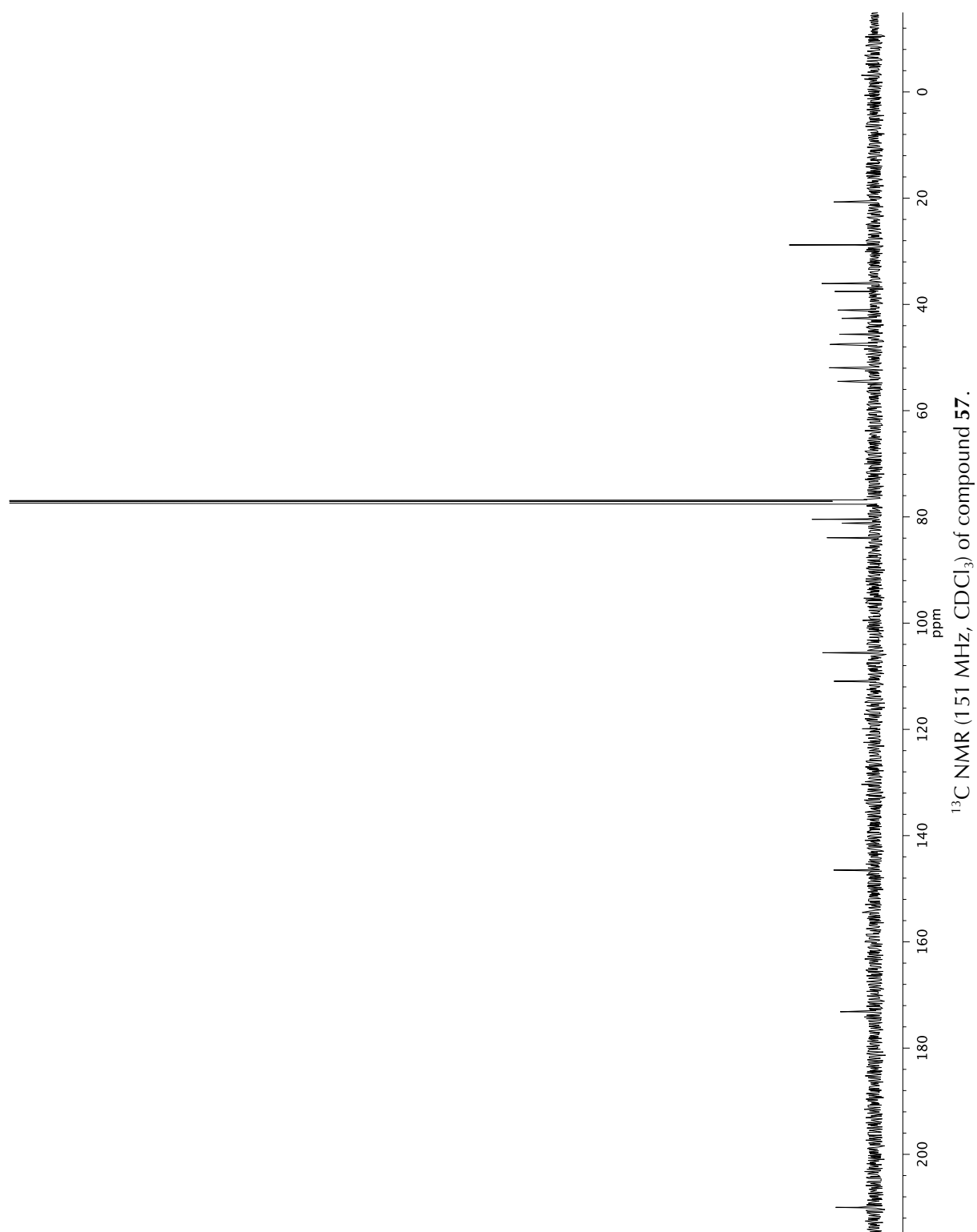


Infrared spectrum (Thin Film, NaCl) of compound **55**.¹³C NMR (126 MHz, CDCl₃) of compound **55**.

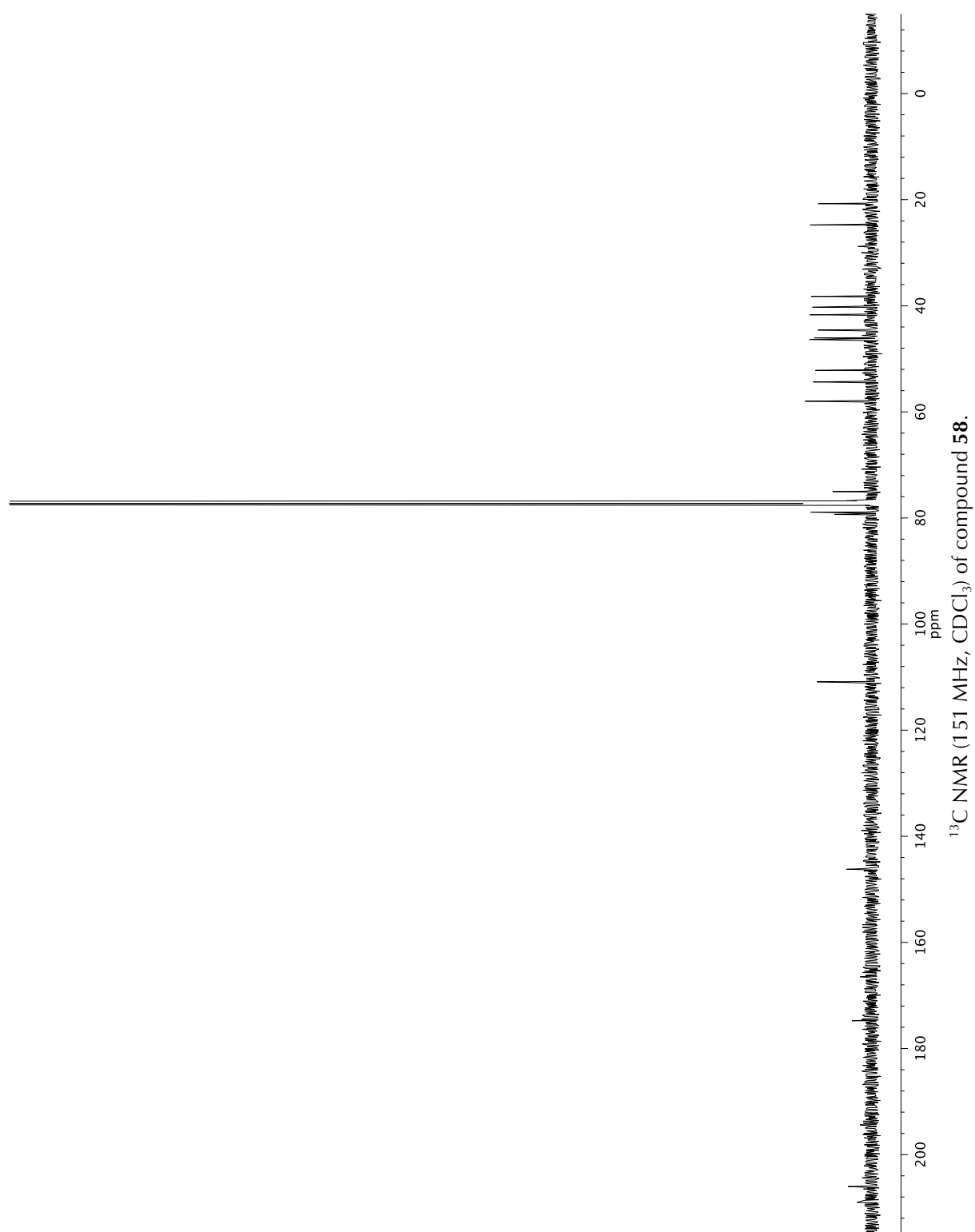


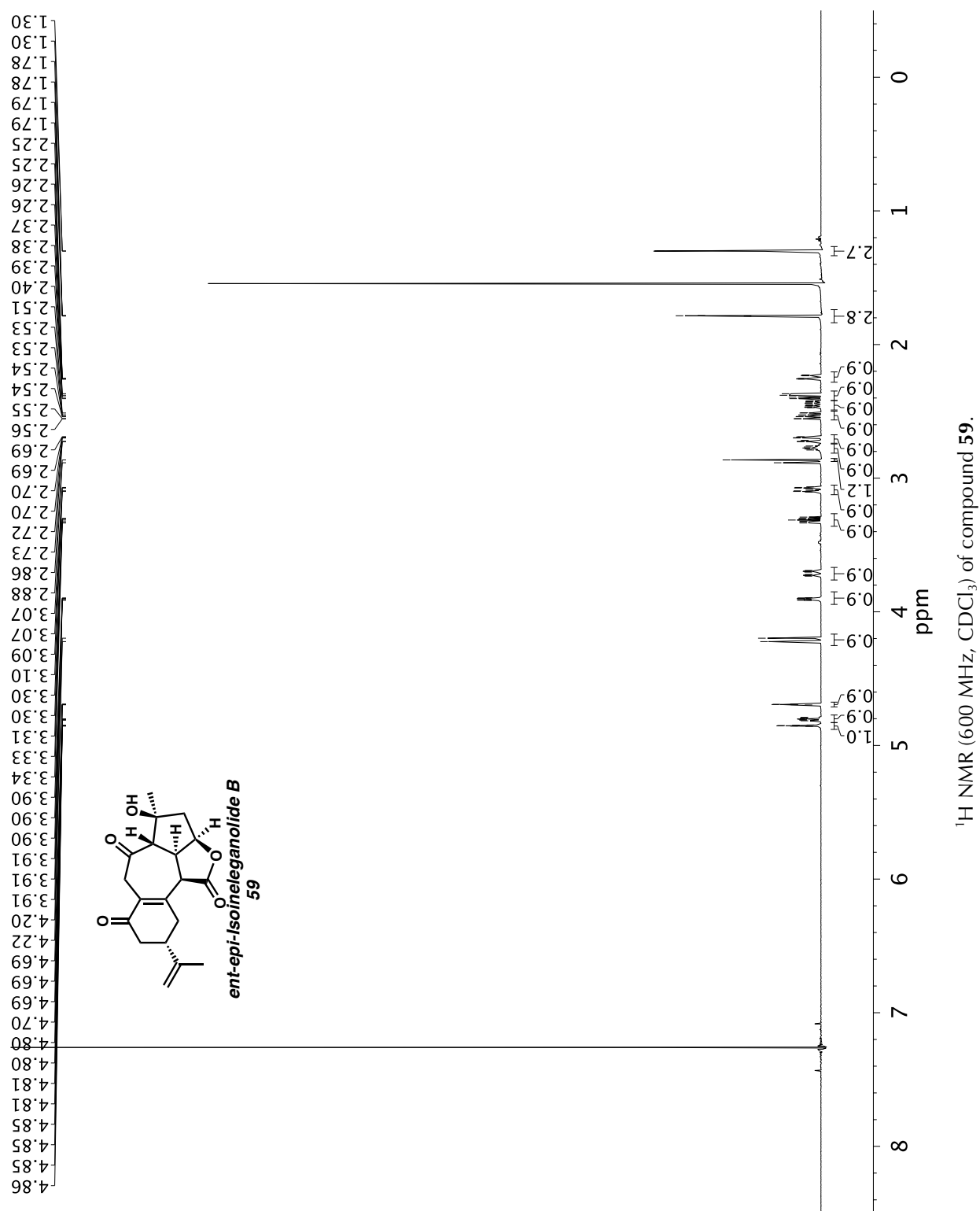
Infrared spectrum (Thin Film, NaCl) of compound **57/58**.¹³C NMR (126 MHz, CDCl₃) of compound **57/58**.

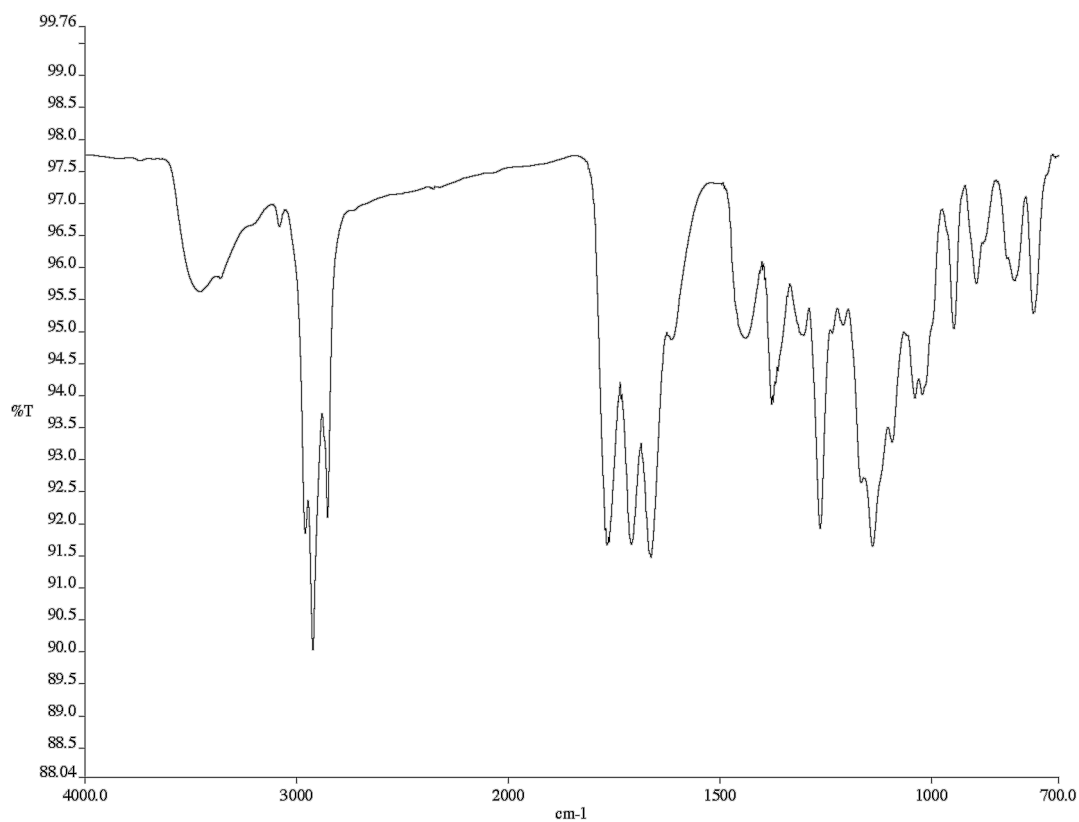
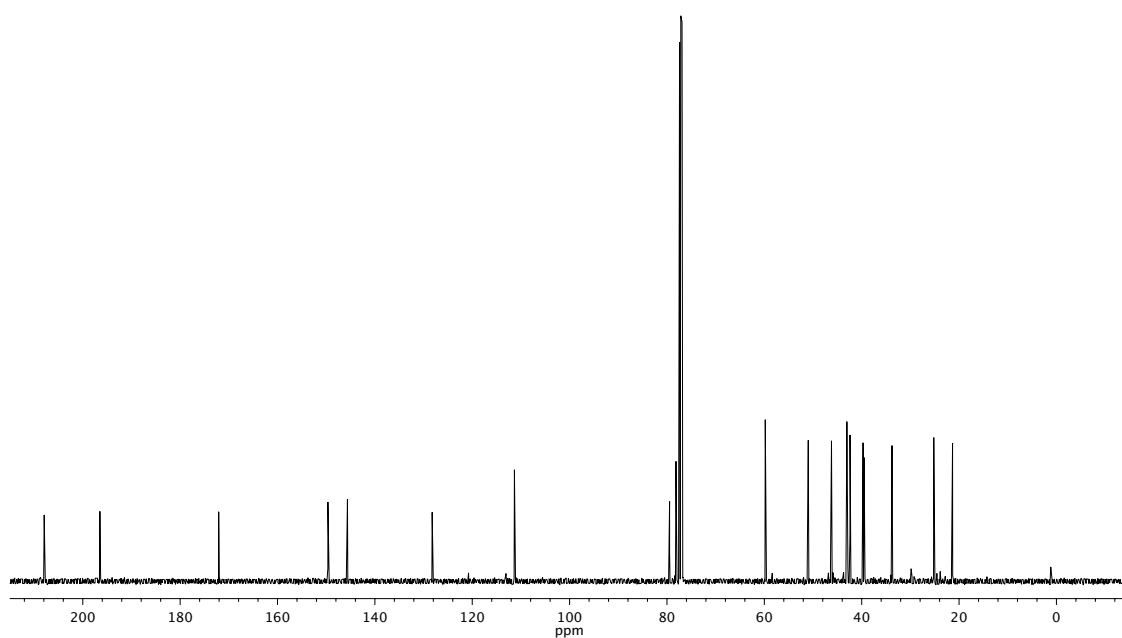




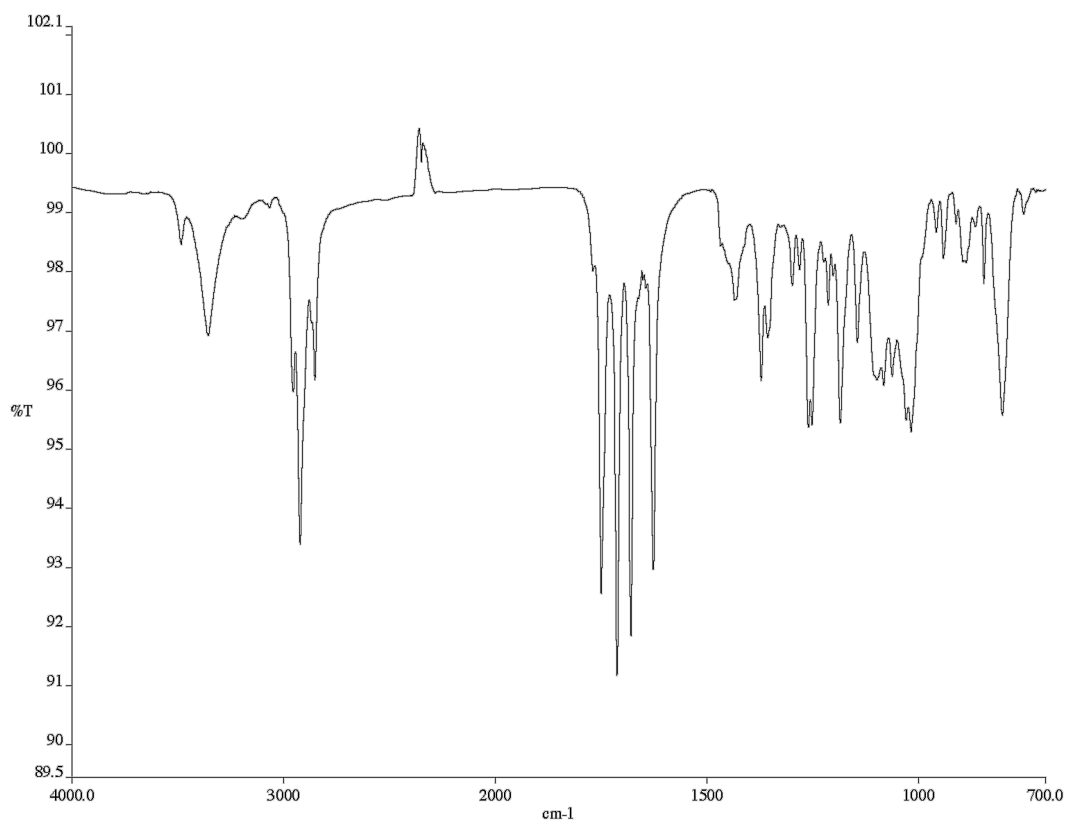
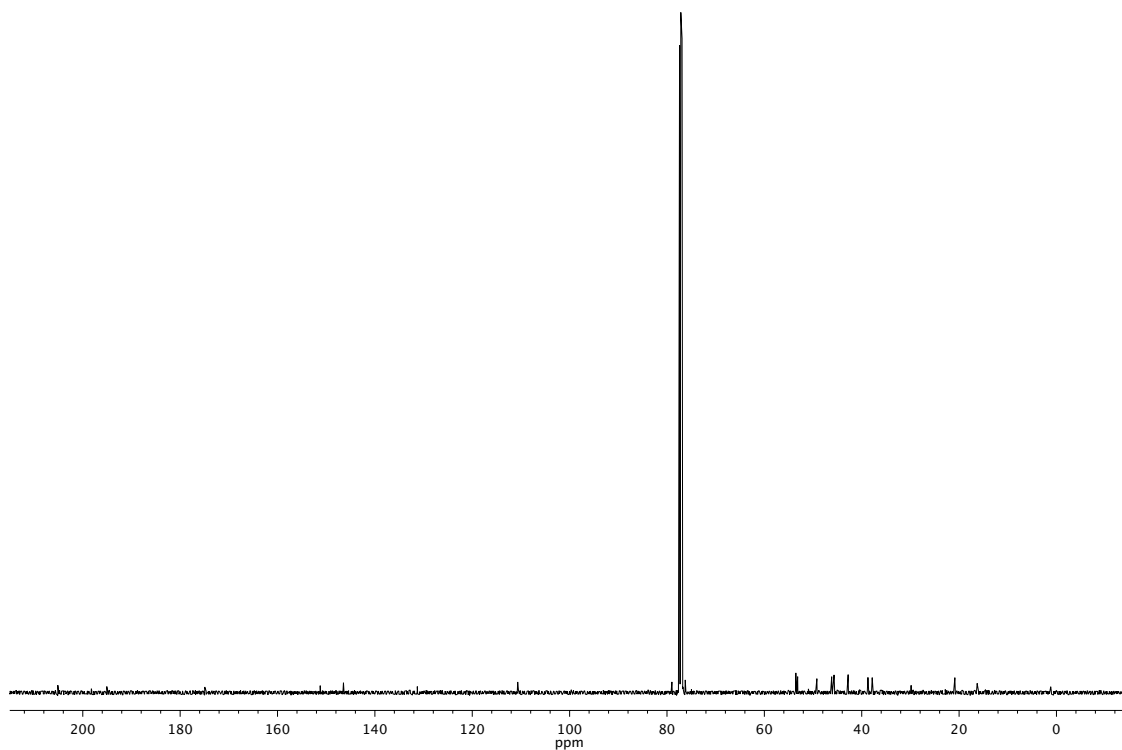


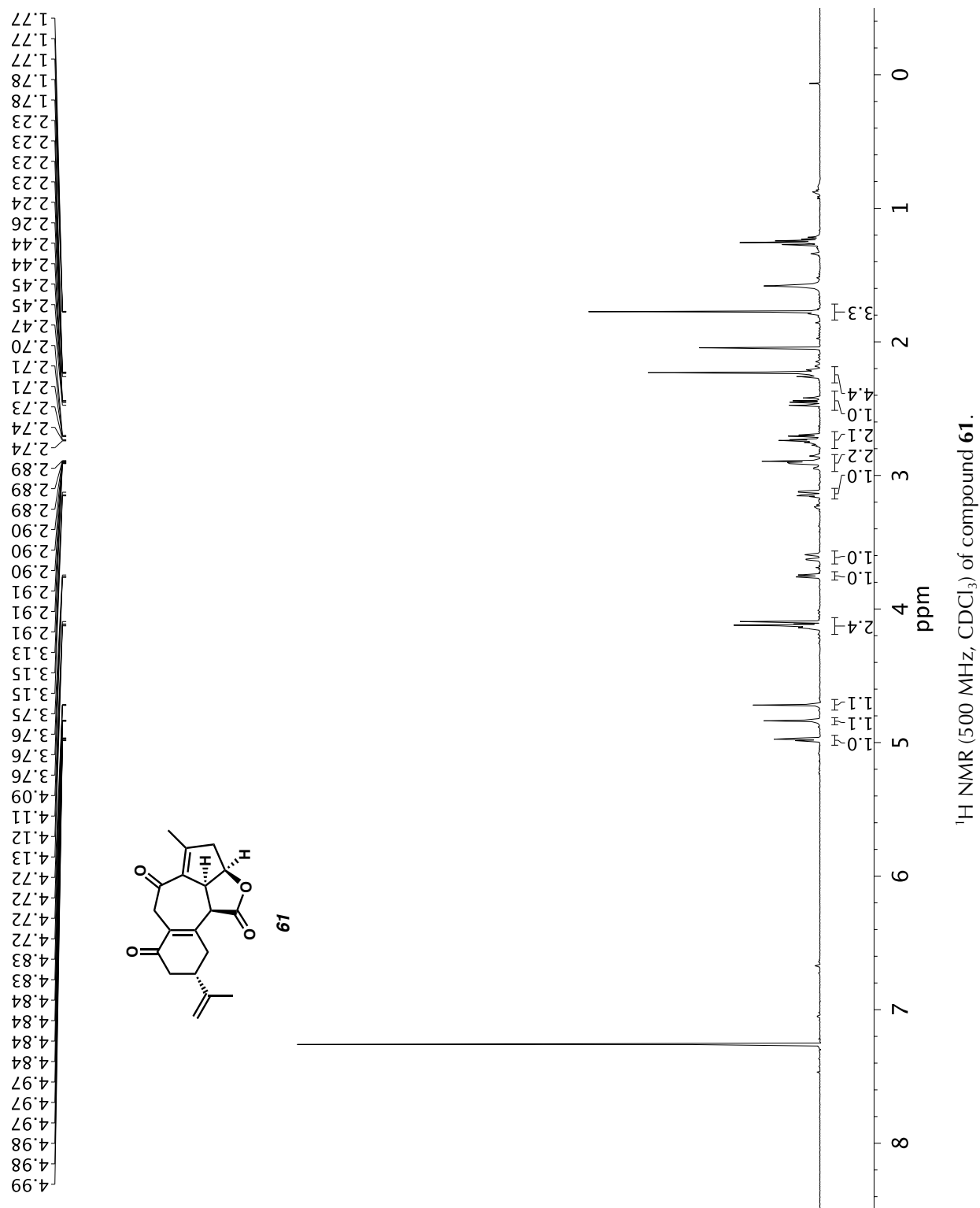


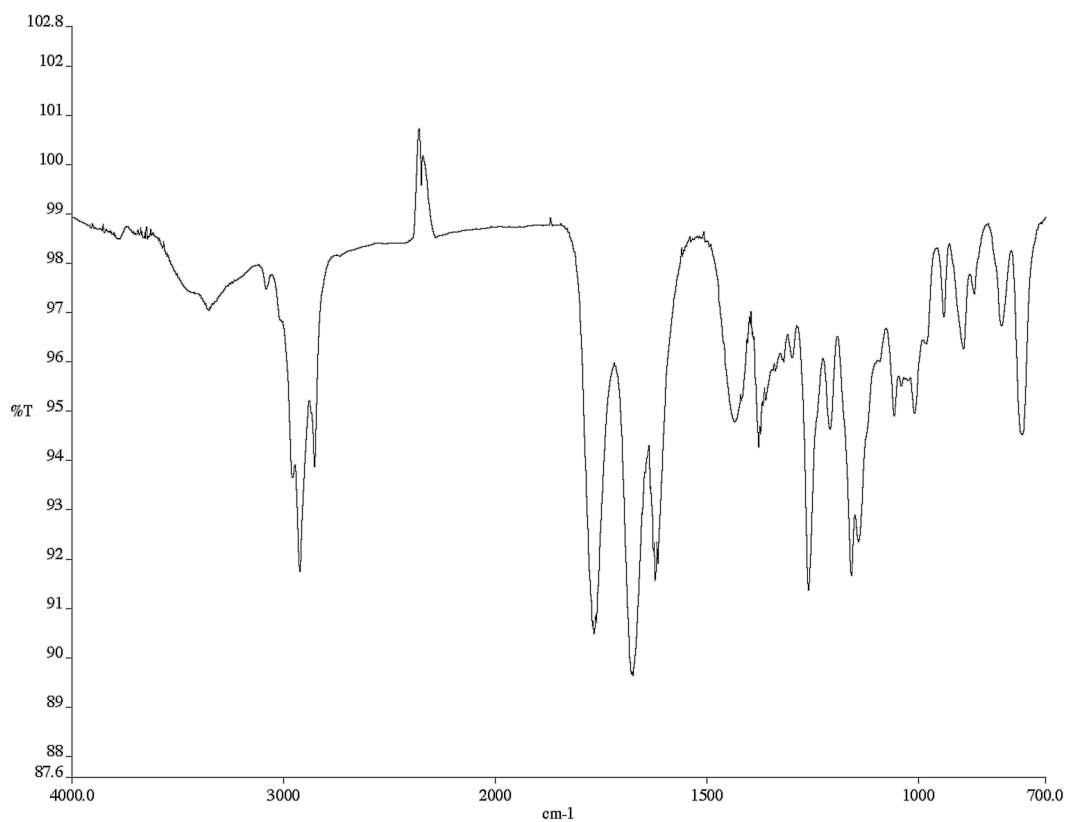
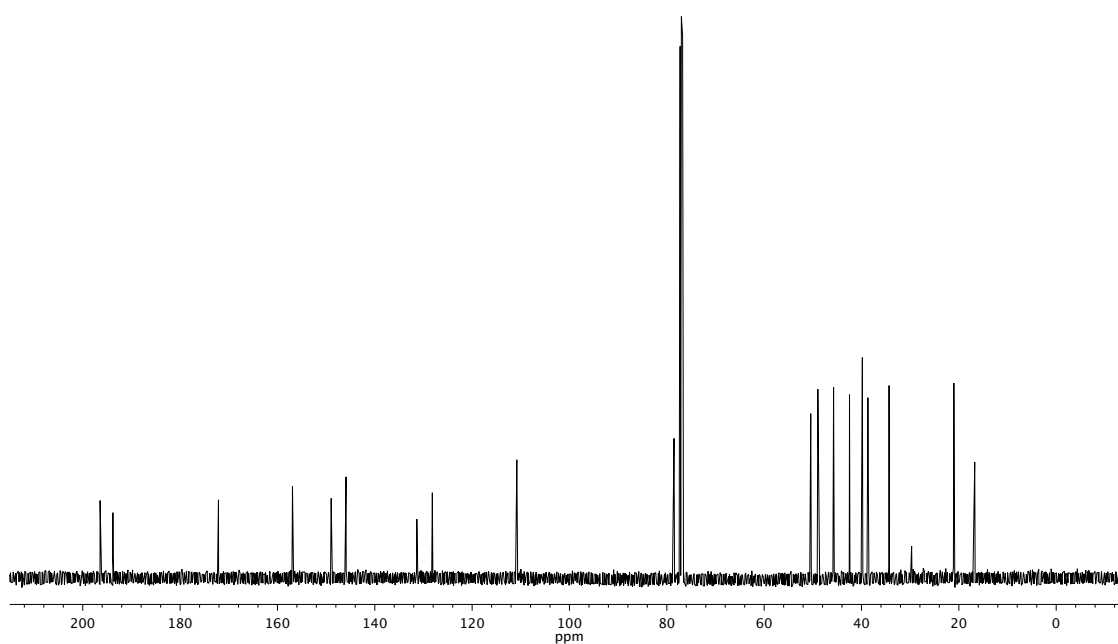


Infrared spectrum (Thin Film, NaCl) of compound **59**.¹³C NMR (126 MHz, CDCl₃) of compound **59**.



Infrared spectrum (Thin Film, NaCl) of compound **60**.¹³C NMR (126 MHz, CDCl₃) of compound **60**.



Infrared spectrum (Thin Film, NaCl) of compound **61**.¹³C NMR (126 MHz, CDCl₃) of compound **61**.